

Winters's Patent Drill-Machine.

Fig 1

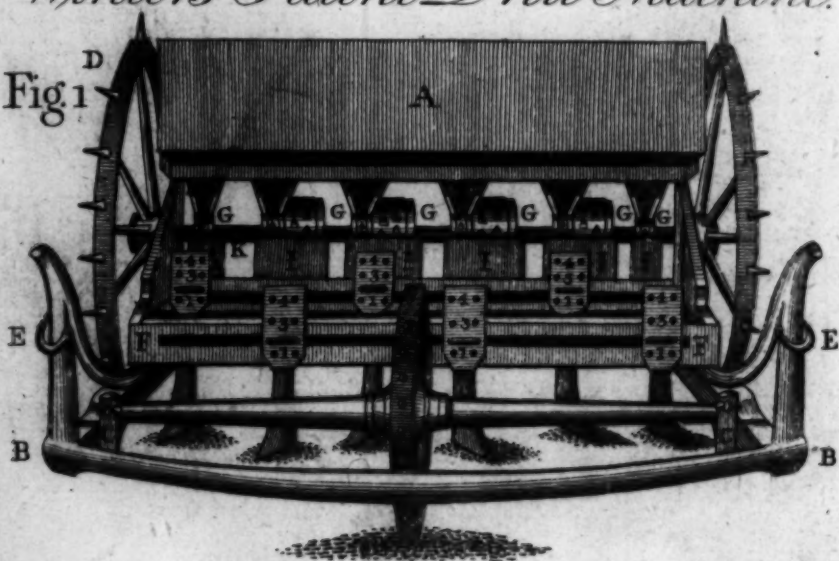


Fig 2

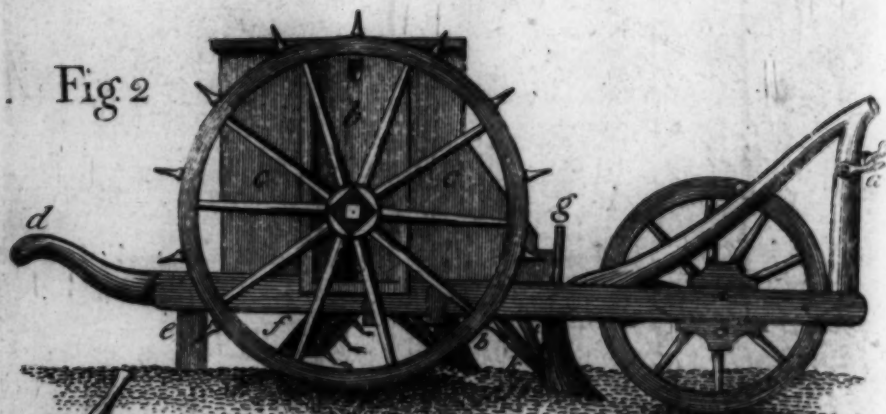


Fig 3



Winters's Patent Drill-Machine.

Fig 1

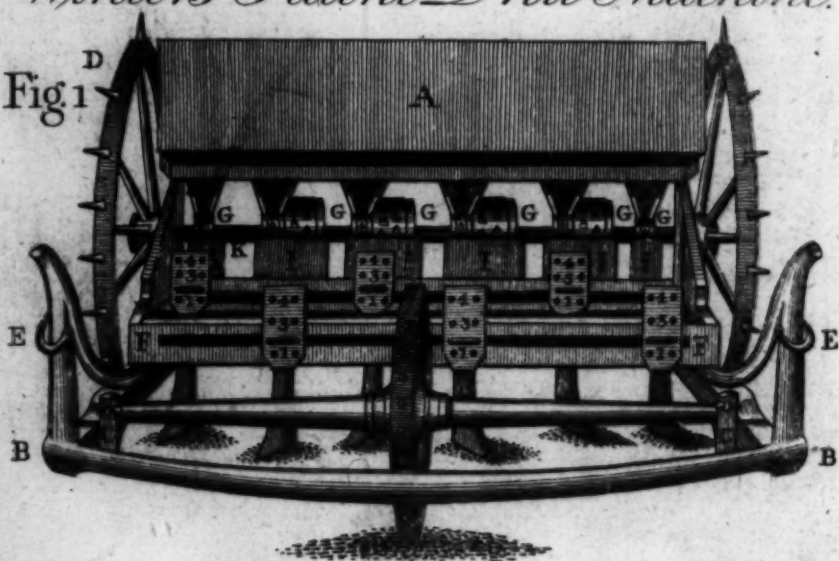


Fig 2

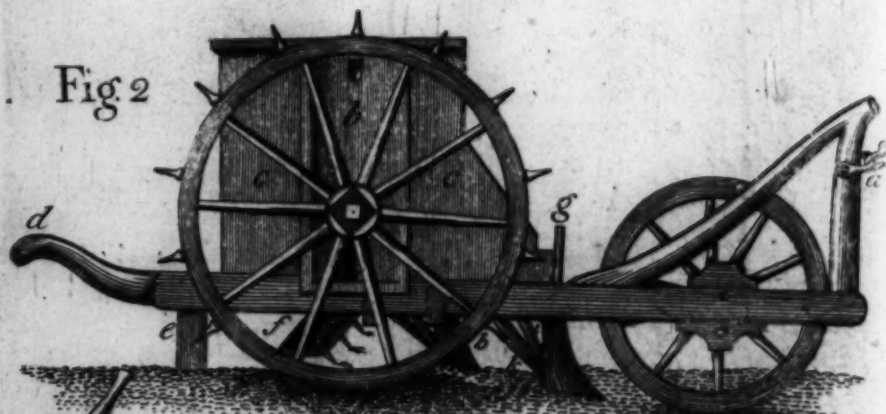


Fig 3



869

A
COMPENDIOUS
SYSTEM OF HUSBANDRY.

CONTAINING
THE CHEMICAL, PHILOSOPHICAL, AND MECHANICAL
Elements of Agriculture;

ILLUSTRATING

- | | |
|--|---|
| I. The properties of different soils.
II. The properties of manures, and their effects.
III. The most advantageous method of applying manures on the different soils.
IV. The improvement of lands.
V. The great superiority of, and the numerous advantages resulting from the drill, to the common mode of husbandry, clearly pointed out.
VI. Experiments on grain of different sorts.
VII. Experiments on tur- | nips, with the most effectual recipe for preventing the ravages of the fly.
VIII. Experiments on fruit trees, with an account of a new, cheap, & effectual manure.
IX. Experiments on fattening of hogs.
X. A copper-plate, and description of a <i>patent drill machine</i> , for planting all sorts of seed, grain, and pulse.
XI. The application of substances for the analysis of soils and manures. |
|--|---|

TO WHICH IS ADDED,

- | | |
|--|--|
| XII. The cause of and cure, for the rot in sheep.
XIII. The most advantageous method of cultivating land without summer fallows | XIV. The cause of, and cure for the smut in wheat.
XV. A sure and safe recipe, for gentlemen, who farm their own estates, to get money rapidly. |
|--|--|

BY GEORGE WINTER, *K.*

WHO WAS A PRACTICAL FARMER, TWELVE YEARS;

SECOND EDITION.

Printed for
MRS. E. NEWBERRY, LONDON;
AND SOLD
BY ALL THE BOOKSELLERS IN GREAT-BRITAIN.
M,DCC,XCVII.

A
COMPTON

*An explanation of provincial words made use of in
this treatise.*

—•—•—•—•—•—•—

AIL. The long prickly part, growing on one end of a grain of barley.

HAYNE. To secure from cattle, to preserve the grass for mowing.

POACHED. Horses or cattle walking over wet land, and making deep impressions thereon with their feet.

POOKS or POOKING. Small mows made in the field.

RUTS. Hollow passages made in the land by moles, rats or mice.

STUMPING. Beating off the ails of barley, by an iron made in the form of a gridiron.

TILLER. To branch or shoot out many stalks from the root.

TYNES. The teeth of a harrow.

HUCKMUCK. Used by brewers, made of twigs in the form of a bottle, and fixed to the cock, to prevent the malt being carried off with the wort.



TO HIS

GRACE

THE

DUKE OF BEAUFORT.

MY LORD,

HAVING the pleasure of living in the same county with your Grace, and not many miles distant from your residence, I was particularly ambitious of being permitted to dedicate the following treatise to you, as well on account of your being a promoter of every degree of *useful* knowledge, as by your judicious conduct in public and private life, setting an example most worthy of imitation.

Greater

Greater improvements having been made in all the other arts than in agriculture, which of all sciences is the most beneficial to mankind; the following attempt to improve in that line, can claim no other merit, than a sincere intention of endeavouring to promote and increase, upon the most rational principles, the real strength and wealth of the kingdom. With this view, I flatter myself, I shall obtain the approbation and patronage of your Grace; and shall think myself happy, if I may be deemed to have been, not altogether, an useless member to society.

I have the honor to be, with

The highest respect and esteem,

Your GRACE's

Most obedient and most

Devoted humble servant,

GEO. WINTER.

PREFACE.

THE author thinks it necessary to inform the reader, that the following minutes, and observations, were only registered for his own private inspection, and never intended for publication, until the repeated solicitations of his friends and acquaintance, became irresistible.

The first edition, consisting of one thousand volumes, was sold in a short time. The very numerous enquiries for the publication since, has been an inducement for publishing a second edition, to which are added many very valuable additions, being experiments made, since the first edition was printed.

In

In the year 1778, the author became a pupil of Mr. Warltire, who was a professor of chemistry, natural philosophy, and agriculture, which the author practised with the greatest attention for twelve years. His bad state of health, was his only motive, for being instructed in chemistry, &c. In the year 1782, the author became possessed of his uncles' (who was a physician) most invaluable manuscripts and books; his manuscripts were most methodically arranged, viz. the diseases alphabetted; the two folio pages, were divided into four columns; the first column contained the patients name, and place of abode; the second, the disease; the third, the medicines prescribed; and the fourth column, the effects of the different medicines, on the various constitutions. The author had been liberally educated; his attentive perusal of those manuscripts, were so pleasing and instructive, as to induce him to commence the practice of physic on himself

self, agreeably to his late uncles' manuscripts, &c. which, with the addition of his former knowledge, enabled him to prepare his own chemical medicines, &c. whereby he was cured. Hence, he felt the strongest propensity for medical studies. He next practised physick on his servants, and the poor in his neighbourhood, upwards of fourteen years ago; and for the last ten years, appropriated a certain number of hours, three days in a week, to attend to poor people; and has enjoyed the most infinite pleasure, by restoring health to poor labourers, and journeymen, who had wives and many children to maintain, who had no parishes to support them in this city, and of having cured many hundred persons, of different diseases, viz. even persons afflicted three years with dropsies. Epileptic fits; most particularly one case, a young man 20 years of age, who had been subject to fits, and who had laboured under that heavy load of affliction from his birth. Great numbers of bilious

bilious complaints. Violent agues of five months standing, within seven days. Rheumatic complaints he soon removes. Gives ease to the most excruciating gouty pains within three hours ; and has effected many cures, when the constitution was not too much debilitated, or chaulk stones formed ; or when it had not been of too long standing. Nevertheless, on the 26th of June, 1793, a man aged seventy years, was by the 29th of July, perfectly cured, except a little tenderness in his feet, which soon wore off : the same person is at this time living, and enjoys a good state of health. The author has given ease to the most violent spasmodic pains in the stomach, bowels and sides within ten minutes, and which has been entirely eradicated in a short time. In the year 1791, he cured a lady within six months, who had been afflicted with most violent spasms, &c. about thirteen years ; and who is now perfectly well. One case was so extremely particular, as perhaps never to have been read, or heard of. On the 6th of March 1793, a farmer aged forty four,
living

living at the distance of three miles from Bristol, applied to the author; his information was, that on every *rogation eve*, for the eleven years preceding, he was attacked with most violent spasmodic pains, which caused a kind of stupor, and langour, that continued, sometimes six, seven, or eight weeks, and thereby rendered him incapable of attending to his business. On the 24th of May following, he came to inform, that he was perfectly cured; and has ever since, and does at this time, enjoy a good state of health.

A lady aged sixty two, afflicted with a gouty habit of body upwards of twenty years; a continual pain in her stomach and side; lost the use of her right hand in June 1795; did apply to the author on the 19th of February, 1796, who perfectly cured her in the course of about five months, and at this time she enjoys as good a state of health, as at any one period of her life.

A gentleman's

A gentleman's coachman, aged thirty, who resided about six miles from Bristol, had, some little time preceding, caught a most violent cold, which fell upon his lungs, and occasioned a very deep decline. He applied to the author, on the 2d of June, 1791, and although his case was extremely obstinate, by strictly attending to the necessary directions, &c. he was perfectly cured within six months, and now enjoys a good state of health.

A young gentleman aged 25, had been ill upwards of two years ; a very rapid decline had commenced. On the 17th of November 1796, application was made to the author, and before the 1st of February, 1797, he was perfectly cured, and at this time enjoys a good state of health.

These, with many hundred other cures, have been effected by the author, who can, from long experience and observations in
 physiognomy,

physiognomy, discover the diseases, of nine afflicted persons out of ten.

The only motives, for the previous information given, is merely to discover to the reader, how the author (*stimulated by an irresistible impulse, as he does not spend his evenings at coffee houses or taverns, he is never happy at his leisure hours, without perusing some favorite medical author, and whose thirst after useful information, grew insatiable* *) acquired

* The author also; had the curiosity to learn of the late Dr. Demainadust, the science of invisable influence, vulgarly called Animal Magnetism, by which only, without the assistance of medicine, he has relieved great numbers of persons of different pains, and even without their knowledge of having been treated,—As a specimen. In the month of March, 1796, the author dined in company with four gentlemen, one of whom an entire stranger to the author, complained of having had a violent pain in his left side for some time, which he could not get removed. The author immediately treated him, without his, or any of the companies knowledge until after the operation was effected, and within half an hour, the gentleman solemnly declared that

acquired his knowledge in the different sciences ; *whereby he became the better enabled to make with precision, the following experiments herein contained*; and which are presented to the public, for their attentive perusal and instruction.

N. B. The author's particular engagements, have for some time past, prevented his superintending the business of his drill machines, which he now lays open to the public.

BRISTOL,
1st September, 1797.

that he was entirely freed from his pain.—About six months after, the author accidentally met him, who returned his sincere thanks for being cured, and declared that he had never since, had the least return whatever, and which can be attested,—as also several other similar cures.

However ridiculous or marvellous, such transaction may appear, yet, it is not less extraordinary than true,—no one could treat the science with greater ridicule and contempt than the author, until he saw such things performed, as staggered his ideas, in the strongest manner, which induced him immediately, to become a pupil, at the expence of thirty guineas.

ON AGRICULTURE.

THE numerous Volumes which have already been published on Agriculture, by authors of the greatest abilities and experience, render it in some measure, a kind of presumption, to attempt making public any further Observations and Experiments. But, when the author reflects that Agriculture is not reduced to a regular system, or arrived at that degree of perfection, which other Arts, Manufactures, and Sciences have attained; and as it is universally acknowledged that every person who contributes, or endeavours to contribute to the public good, deserves applause; he trusts that such observations and improvements, as tend to promote the public welfare, will be deemed worthy of some attention.

A

Health,

Health, one of the greatest blessings mankind can enjoy on this side of the grave, for many years, obliged the author to reside the greatest part of his time in the country. Activity and inclination induced him to make practical Agriculture and Improvements in Husbandry, his amusement and principal study.

The experiments made, with quotations from authors (whose veracity may be depended on, and whose experiments he deemed the most truly advantageous) were originally minuted at his leisure hours, and intended only for his own private inspection and future instruction; that he might thereby avoid errors, and be enabled to pursue the most advantageous plan. The repeated solicitations of his friends and acquaintance, united with the idea he entertained, that every member of society ought to communicate what he has discovered, induced him to publish the present

sent Treatise ; which he endeavoured to write in such plain language, as might suit the lowest capacity.

The multiplicity of improvements that have been lately made in Arts, Sciences, Mechanics, and Manufactures, should animate the Farmer to be no less attentive to Agriculture ; which is so necessary for the subsistence and welfare of mankind in this and every other kingdom. The most illustrious heroes, philosophers, and poets among the antients, studied to encourage, improve, and even practised Agriculture. The most noble Roman Consuls and Dictators were taken from the plow ; the Senators of that once flourishing people, and the most learned men of all ages, made Agriculture their chief study and employment ; esteeming it to be the original and genuine source of the strength, wealth, and prosperity of every nation.—The nobility and most learned and ingenious men

of the present age, animated with the public welfare, have condescended not only to study and practise Agriculture, but likewise to encourage and promote this noblest of Arts with indefatigable zeal. It is to such men of understanding and liberal sentiments, the public are indebted for the very great improvements so lately made in Agriculture, and all other Arts.

Every man, whose natural abilities have been cultivated by education, should certainly study the improvement of such Arts and Sciences, as tend to promote the public welfare.

Man was not born merely to eat, drink, sleep, or to spend his time in hunting, shooting, gaming, idleness, dissipation, and sensual gratifications ; but to be industrious and useful to society ; and ought to leave some record of his actions, as a testimonial
of

of his endeavours at least to be useful, to the present and future generations.

Men pursue different objects, as their inclinations and fancies lead them ; but of all the Arts, Agriculture when properly conducted, is one of the most useful, profitable, pleasing, rational, and healthful amusements in life.

The Agriculturist, whilst riding or walking round his farm, fully enjoys the sweet refreshing breeze, so necessary to the preservation of his health ; and while he attends to his business, may entertain himself with rural sports. Every field and experiment present new objects to his view ; pleasing researches into the Works of Providence, such as the different forms and growth of plants and grain ; analysing the great diversity of soils and manures, that he may thereby ascertain their properties, and be best enabled to destroy the particles

That are injurious to vegetation, and enrich the ground ; which, with the study of mechanical powers, are useful, pleasing, profitable, and innocent amusements, and furnish the active mind with full employment.

The practice of Agriculture is in general confined, either to persons who have not had a sufficient education to enable them to keep regular accounts ; or who are inattentive, and do not chuse to be at that trouble ; without which it is impossible to ascertain the profits and loss thereon ; hence they cannot possibly attain the truth.

The author enabled from his own experience, the regular accounts he kept of each separate field, and observations made on the mode of his neighbours cultivation ; he ventures to assert, that many real losses are sustained by improper management ; such for instance, as not allowing a sufficient
number

ON AGRICULTURE.

number of plowings and harrowings to pulverize and clear the land of weeds; the application of raw dung unmixed with earth, immediately for the crop, harbouring and nourishing insects and weeds, which greatly injure and often destroy the crops of grain; or an improper succession of crops.

—The produce of several fields, of the same kind of grain, are frequently stacked or housed promiscuously together. If a farmer is asked why he does not keep them separate, his answer is the hurry of harvest and the unfavourable season, prevent such practice; therefore he cannot ascertain the increase of the different lands. When a farmer cannot keep the produce of each ground separate, he will find but very little trouble to cut two square perches of the best, and the same quantity of the worst part of his crop; which carried into the barn and threshed out, will employ but little time; if he will proportion the amount of the number of perches

so

so cut, to 160, (which an acre contains) the produce per acre of such field may be easily ascertained ; and should be immediately minuted in his book. He will soon be convinced of the utility of keeping regular accounts ; he will thereby be best instructed whether two, three, or more plowings ; if manured with lime, soapers's ashes, dung, or compost ; when applied with the number of loads per acre ; the time of sowing, and the course of crops preceding ; are the most advantageous.

Should the amount of so small a quantity as four or six perches of land be difficult to calculate by measure, it may be easily weighed, and proportioned according to the weight of each bushel of the same produce. These calculations may be expeditiously made when the hurry of the day is over, or in wet weather, when other business does not interfere. By minuting and registering such accounts in a regular manner,

ner, they can be referred to at any future period. The Agriculturist will thereby be enabled to avoid the wrong, and to pursue the best and most advantageous method. Such a plan will soon become habitual, amusing, instructive, and profitable.

Another material circumstance should be strictly attended to; that of keeping no more horses than are essentially necessary for the work of his farm. Useless horses are an additional expence, consequently lessen the farmer's gain; and as horses and servants are kept at a certain expence, the plowing of every acre of ground should be accordingly charged; otherwise the farmer deceives himself, and his registers must prove erroneous.

The accounts of the authors experiments in this Treatise, will sufficiently elucidate the forms he made use of; which he deem'd
to

to be the most simple, easy, and best adapted to the meanest capacity,

Farmers may be possessed of great natural abilities and knowledge, in the common mode of their ancestors; but every farmer is not a scholar, mechanic, chemist, or philosopher. Their knowledge, and the methods they pursue in general, extend no further than that of their predecessors, or the custom of the country where they reside. Any discoveries made by them are reserved to themselves, and themselves only benefit by it; but men of ingenious and liberal dispositions, no sooner make discoveries, than they are communicated to the public.

Experiments can be of little use, when extended no further than for their own private instruction; and reasoning without experiments, avail but little in the practical Arts. Theory without practice, is similar
to

to a shadow without substance. But when reasoning is founded on science, combined with experiments minutely attended to, it is from thence only, the ingenious Artist or Agriculturist is enabled to draw such conclusions as are of real utility.

The great and general ambition of farmers is, to occupy large farms; the more they possess, the greater consequence they think themselves of;—but one acre of land properly managed, will produce more than double by improper cultivation.

Were farmers to occupy no more ground than their capitals would admit of cultivating in a masterly manner, they would soon be convinced of the great advantages arising there from. They would have no reason to complain of scanty crops, which are generally occasioned by some imprudent management; such as applying manures at improper seasons, or not adapted for the
the

the soil ; or not sufficiently pulverizing the ground ; or the succession of impoverishing, without the intervention of ameliorating crops ; or the treading of corn after it is sowed, by frequent harrowings and rolling to make the surface fine and even, when at the same time the under stratum is, for want of being sufficiently plowed, and by the treading of the horses or oxen, so hardened, as entirely to destroy the seed the cattle tread on, (particularly in wet and stiff soils) ; or prevent the roots and tender fibres from extending themselves in search of food. Vegetables, cannot any more than animals, attain their proper growth and strength without sufficient nourishment. The author does not mean to insinuate that all soils are capable of producing crops equally luxuriant ; he only wishes to be understood, that there is no land, of any sort whatever, (which has a sufficient depth of mould for plowing) but what may be rendered fertile by prudent cultivation, and the application of proper

proper manures ; and in proportion to their different degrees of natural richness, be managed in such a manner, as to produce luxuriant and profitable crops of some species of vegetables : And that by bad conduct, good soils oftentimes produce but scanty crops ; when the blame is too frequently imputed to their natural poverty. Hence for instance, in the brewing of beer, in the baking of bread, the materials may be of the very best quality, yet, from the want of care and proper management, both are spoiled, or greatly injured ; so it is with land.

Experience and daily observations convince, that the best of soils, when they are not properly pulverized, or sufficiently plowed and harrowed, will produce very scanty crops ; but let them have an extra plowing or more (particularly stiff and loamy lands) and it will amply repay the Agriculturist for his extra labour ;—hence,
savings

savings in husbandry, often produce poverty. Whereas were farmers to occupy no more land than they can cultivate in a masterly, instead of a slovenly manner, they would very soon enjoy the great advantages and profits arising from such conduct.—A farmer should always be master of his farm, but if the farm is the farmer's master, loss and disappointment must inevitably ensue.

The practice of husbandry, requires precept, reflection, and study. Agriculture cannot be benefited by theory alone; but when theory is united with repeated experiments and facts, Agriculture, as all other Arts, may by this means be reduced to a regular system.

The principles of Agriculture, are deduced from Mechanics, Chemistry, and Natural Philosophy.

Of

OF MECHANICS.

MECHANICS are a branch of practical Mathematics, which consider the nature and laws of motion and moving powers, with their effects in machines, which are made subservient to the various purposes of mankind; and it is by the knowledge of this science, that the greatest improvements are made of every power and force in nature; by which any work may be more expeditiously executed, and at the least Expence.

In all well managed manufactories the smallest savings of expence in materials, as well as labour, are never neglected. Those Articles which may appear trifling and very inconsiderable at first sight, must on a small scale in a few years, or in an extensive line of business in one year, amount

amount to a very considerable sum. Therefore, why should not Agriculture admit of a similar comparison with Manufactures? This Art is certainly of more real consequence to the community.

The very great advantages derived from machines, in Manufactures, invented by ingenious men of the first abilities and fortunes in that line, are sufficiently known.

The great and good effects of new inventions in Mechanics, are, by the wisdom of the legislature, well secured. Individuals are protected against the oppressions, and unjustifiable combinations of avaricious and servile imitators; who may be compared to the drones, supported by the labours of the industrious bee:—Such security to inventions, encourages the ingenious artist to risque his labour, and property, in new and useful attempts.

Of

OF CHEMISTRY.

CHEMISTRY is an art, by which mixed bodies are separated, or reduced into their component parts; thereby, the several properties of soils and manures are discovered; that such manures may be applied, as will destroy any bad qualities that prove hurtful and poisonous to vegetation; and which fertilize the soil.

As all lands differ materially in their qualities, so different manures should be accordingly applied.

B

OF

OF SOILS.

A SANDY SOIL.

S**ANDY**, or gravelly Soils, have no cohesion of their parts. Sand, too readily admits the heat of the sun, to the roots of the plants, by which they are scorched and destroyed; and has not sufficient tenacity, to afford security against severe colds and hard frost. Sand, without the mixture of earth, contains no oleaginous or other particles, that can contribute to vegetation: rain, and moisture, pass through it too easily to afford nourishment for plants; therefore the dung of horned cattle, (which is rich and

and cooling) mixed with clay or marle, is the most cohesive and enriching manure, will the longest retain moisture, and at the same time convey proper nourishment; hence it is best adapted to such soils; and in proportion to the quantity of loam mixed with the sand, its tenacity and vegetative properties are increased or decreased.

Green crops of turnips, buck-wheat, clover, or vetches plowed in, or fed with sheep hurred thereon, greatly enrich such soils. Green crops when plowed in, should be immediately rolled with a heavy stone roller, which consolidates the loosened earth, causes a speedy fermentation, produces a mucilaginous matter, which gives tenacy to the soil, and is converted into nourishment for plants.

OF A CLAY SOIL.



CLAYEY Soils differ as materially as sandy soils. The oleaginous and earthy particles of some kinds of clay, are so closely combined as to retain water, which is permitted to escape only by evaporation.—All sorts of clayey soils contain more or less oil, in proportion to their tenacity. A tough clay retains moisture so much, as to rot the seeds and roots of plants. Clay does not admit the free access of heat and air, (which are essentially necessary for promoting vegetation,) and it is so baked and hardened by the heat of the sun, as to prevent the tender roots and fibres of plants from extending themselves in search of food. Hence, such manures as will open its pores, destroy its adhesion, and correct its bad qualities, should be applied. Lime, coal, and soap's ashes,

ashes, are best adapted for clayey and stiff soils when they are first plowed.

OF A LOAMY SOIL.

LOAM is a medium between light and stiff soils; differs in quality as materially as either.

Black, and hazle colour soils, are generally the richest, and most proper for the support of vegetables, as they contain a sufficient degree of cohesion, and at the same time are so friable, as readily to admit the roots and fibres of plants, to extend themselves in search of nourishment.

Red, and other coloured soils, generally contain a mixture of iron, copper, or lead,

or some acid, which is poisonous to vegetation. A proper application of quick lime (as hereafter directed, with an increase of quantity, as exigencies may require,) will effectually dissolve and destroy those pernicious particles, which, with the assistance of dung and sufficient plowings, will render the most barren soils fertile.

It must be remarked, that according to the quantity of metallic particles impregnated with the soil, so in proportion should the quantity of lime be accordingly applied.



OF MOORS AND BOGGY SOILS.



MOORS and Bogs generally consist of rotten trees, roots of weeds, and other half dissolved vegetable substances, which, having

having undergone some degree of putrefaction, are, (similar to all corrupted vegetables) converted into a black rich spongy kind of earth, that readily imbibes moisture; and its sponginess arises more or less, in proportion to the quantity of mud or slime carried over it by floods, which, with the acid contained in the stagnated moisture, prevent a complete putrefaction.

The first thing necessary to be done, in order to improve Moors and Bogs, is, to make proper inclosures, and drains of a sufficient depth to carry off the stagnated waters; as their surface are a composition of moss, fibrous roots, and coarse grass, they should be pared (to such depth as the roots penetrate) and burnt; such ashes abound with alkaline salts, which must be spread over the land. Where lime can conveniently be procured, eighty bushels or more per acre, should be laid on in piles of about half a bushel to a perch, and as

soon as flacked, it must be spread over the ashes, (for the reasons that will be assigned under the article wood ashes,) which should be plowed in, not more than four or five inches deep. By this method a fermentation and putrefaction will ensue, and after being exposed a few weeks to the influences of the atmosphere, the surface should be well worked with loaded harrows; which will tear a sunder, and mix the lime and ashes with the soil. The vegetable substance contained therein will soon be dissolved, and converted into an exceeding rich and fertilizing manure.

The specific gravity of lime, and other manures, are so great, as to be continually falling downwards, therefore it is essentially necessary that the first plowing, should not exceed the depth of four or five inches.

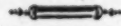
The second plowing should be to form the ridges, by which the ashes and lime
that

that were plowed in, will be turned upwards, and after being thoroughly incorporated with the soil, by harrowing, may be planted with potatoes, or such other vegetables, as may best suit the judicious husbandman's inclination.

As Moory, and Boggy lands, are generally light and spongy, an addition of marle, clay, or loam, will add cohesion to their parts, and will in a very short time, most amply repay the Agriculturist.—Moory or Boggy lands, that do not produce five shillings per acre, may by this mode of management be made to produce forty shillings per acre, or more.

Of

OF HEATHS AND GOSSY GROUNDS.



HEATH and Goss when reduced into ashes, are of the same properties as wood ashes, which will hereafter be fully illustrated. If heathy, or gossy lands, contain a sufficient depth of mould, the roots should be dug or plowed up, burnt, and spread over the surface, with lime; and afterwards managed in the same manner as peaty or moory soils:—By a regular and proper cultivation, with an occasional application of lime or other manures, the roots will be destroyed, and the Agriculturist soon benefited by his industry.

OF

OF MANURES.

LIME.

QUICK, or unflaked Lime, contains no salts ; when flaked, attracts oils, acids, and salts, from the earth and atmosphere. Clayey, and other soils, when first broken up or plowed, contain various mineral and poisonous particles, weeds, worms, grubs and insects; all which lime dissolves. The oils, and salts, absorbed from the earth and atmosphere, then become so intimately united with the animal and vegetable substances, already dissolved by the lime, as to be converted into a soapy matter,
by

by which they are rendered miscible with water, and become the food of vegetables. Lime, by its expansive force, opens, divides, and lightens a stiff soil, by which it is the easier pulverized; and gives a greater friability to stiff soils, than any other substance whatever excepting coal ashes. It is thus the roots of plants are permitted to extend themselves.

Lime, when too frequently and injudiciously used, is a great impoverisher of lands kept long under tillage. It exhausts the earth by absorbing its oily particles; hence the soil is rendered barren. The only remedy for such misconduct, by which the soil can be restored, is a compost of rotten dung and earth, or scrapings of a lime-stone road and dung, twice turned and properly mixed; or a thick crop of buck-wheat, clover, vetches, or turnips plowed in, and rolled with a heavy roller: such management will soon recruit the soil, and restore it to its proper vigour.

Lime

Lime, when properly and judiciously applied, ranks first amongst the class of manures, particularly for all sorts of stiff or loamy soils. The quantity best adapted, after the first breaking up or plowing of clayey and stiff lands, containing mineral and pernicious particles, should be from one to two hundred bushels per acre, (or in proportion to the quantity of poisonous particles contained in the ground) laid on in piles of a proportionable quantity to a square perch. As soon as flaked it should be regularly spread on the fallow, and immediately plowed in.

After the surface has been sufficiently exposed to the atmosphere, (which may be easily known by the crumbling of the soil,) it should be well dragged, and the clods broken by a heavy roller. The next plowing should be to form the ridges; the lime is thereby turned upon the surface, which should be properly dragged and harrowed,
(agreeable

(agreeable to my *New Mode* of culture, as hereafter described,) to prevent any incrustation of the lime ; and to be thoroughly incorporated with the soil.

The specific gravity of lime, is so great, as to be continually falling downwards ; but, by being thus mixed with the soil, (which I have before observed is lightened and divided by its expansive force, and corrected by its caustic, absorbent, and dissolving powers) it then attracts oils and salts from the atmosphere. A full confirmation of this assertion, any person has in his power, by examining the nitrous particles on old walls ; which particles are attracted solely by the lime.

When land has been long under tillage, it is essentially necessary to apply rotten dung with lime, not immediately mixed as a compost, but separately ; (*i. e.*) the lime to be first laid on, regularly spread as soon

as

as flaked, properly dragged, and incorporated with the soil; the dung to be spread after, and immediately plowed in. About eighty bushels of lime, and from eight to ten cart loads of rotten dung, or sixteen to twenty cart loads of dung and earth, twice turned, per acre. Such a quantity, I deem to be the best proportion, for land that has been properly limed when first plowed, and is continued under constant tillage. Too much dung, is very injurious to corn of all sorts, by increasing weeds and harbouring insects; by promoting a too luxuriant growth of straw, which draws the nourishment of the soil, and produces short small ears.

The objection I make, to immediately mixing unflaked lime with dung, is, that as unflaked lime contains very caustic and absorbing properties, it destroys the oleaginous and vegetative particles of the dung, similar to that of fire in burning coal, which

which is reduced from its original, to a very different state. Coal is well known to contain oleaginous, sulphureous, bituminous, and other matters; after it has undergone the action of the fire what remains? Ashes, or an absorbent dust; and but a very small quantity, in proportion to the coal.

By the mode I have pointed out, of applying the lime, and dung separately, the soil is corrected by the lime, and enriched by the dung. When immediately plowed in, the oily particles of the dung are fixed, and prevented from being exhaled by the sun, or volatilized. The dung by its fermentation, opens and divides the soil; the lime corrects the acidity (which is converted into a neutral salt,) or other noxious particles that may be contained in the earth or dung, or both. And after having remained some little time in this state, the ground is again to be plowed and formed
into

into ridges, dragged and harrowed as before directed, when only lime is used.

OF DUNG.

DUNG, of all sorts, contain salts and oils. The dung of horses, hogs, and sheep, is the hottest, and best adapted for stiff and cold soils.

Human ordure, the dung of poultry, and of rabbits, are all extremely hot and rich ; but are procured in such small quantities, as not to merit the husbandman's particular attention. Hence should be mixed with other dung, or earth.

The dung of horned cattle, is fat and cooling ; therefore, most proper for light, sandy, and gravelly lands.

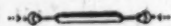
C

When

When dung is carried into the field, where it is intended to be used, the highest head lands, and banks, should be plowed or dug; and the dung deposited thereon, with earth thrown over. The head land, being plowed and pulverised, will readily absorb the essence of the dung; and whatever quantity of the dissolved salts and oils, that may be washed off by successive heavy rains, will be carried over, and greatly enrich that part of the field adjoining to the dung. As the head lands are generally the highest and richest parts of the ground, the earth, being mixed with the dung, will make a good compost; and for every twenty loads of dung, when spread on by itself, ten loads, by being thus managed, will prove nearly, if not equally as advantageous, as when dung only is laid on. Hence, two acres of land, in lieu of one, or in proportion, may every year be manured; exclusive of the advantage of making the land even.

OF

OF FARM YARDS AND COMPOSTS.



SUCH parts of the farm yards, where the dung is deposited, should be dug about two feet lower than the surface; by this method, the urine and essence of the dung, will be retained, and not liable to be carried off by rains. Pools or reservoirs, should be made on the lowest parts adjoining to the dung hills, to receive the superfluous drainings, which should be carried over the land in water carts, such as are used to water the roads, and streets in London.

When the yards are cleansed of the dung, a stratum of about six inches deep of earth from banks, or uneven parts of fields or commons, ant-hills, scrapings of
C 2 roads,

roads, sweepings of filth surrounding the buildings, leaves of trees, fern, thistles and coarse weeds in full sap, before their seeds begin to ripen, and all other articles that can be converted into manure, should be spread on the bottom of the hollow part of the yard; those different articles will rot and imbibe the essence of the dung laid on them. When convenient opportunities permit of depositing alternate strata in this manner, an exceeding good compost is made at a small expence, and the quantity of manure is greatly increased.

I must particularly observe, that the refuse straw and other articles at the barn doors, as containing the seeds of different weeds, should not be mixed with dung, but made into a separate compost for pasture lands only. When such manures are carried on arable lands, those seeds will vegetate, and fill the ground with noxious weeds,
which

which will be nourished with that food intended for the support of vegetables.

I have particularly mentioned the turning and mixing of dung only, or dung in a compost, to be performed twice. I entirely object to its being turned oftener, for the following reasons;—When turned twice, the compost will be sufficiently incorporated; the fermentation and putrefaction will thereby be rendered complete, and converted into a proper aliment for plants. But when turned too often, or exposed to the sun and atmosphere for any time, the oily and saline particles will be exhaled and volatilized, by the heat of the sun and the atmosphere. Hence, when used for tillage, the compost should be immediately spread and plowed in; by which operation the volatile oil and salts, will become fixed, and united with the soil.

When compost is applied to pasture, the

C 3

latter

latter part of October or beginning of November, is the best season. The heat of the sun is then too weak for exhalation; the nourishment is washed into the ground by the autumnal rains; the remaining gross parts left on the surface serve as a coat, to keep warm and protect the roots of grass, from the chilling cold and frost.

I have attentively observed, that piles of dung and earth, in alternate stratum, which lay unturned about eighteen months; the straw, from nearly the top to the bottom, appeared as free from putrefaction as when first thrown out; the stratum of earth were so hardened, as to prevent the air and rain from penetrating, both which are essentially necessary to promote fermentation and putrefaction. The compost, by being well mixed and turned twice, became perfectly incorporated.

COAL

COAL ASHES AND BURNT CLAY.

COAL ashes, and burnt clay, are absorbents, and act nearly similar to lime, but not so powerfully, for dissolving metallic particles, and weeds. Coal ashes is superior to lime, or any other manure, for opening a stiff soil, and making it more friable, by means of the small cinders, not dissolving as lime.

SOAPER'S ASHES.

SOAPER's ashes, are an excellent manure, superior to most, but inferior to none, (excepting coal ashes) for clay, stiff cold soils, and loams. Soaper's ashes are a composition of lime and wood ashes, and of equal service for arable and pasture lands; the quantity of from one hundred and sixty, to two hundred bushels per acre, is the most proper.

When applied to arable land, they should be managed as lime; and the effects will continue for several crops. When applied for pasture, they destroy several sorts of weeds, produce white clover, and an excessive sweet herbage, which will continue several years. Soaper's ashes, being of a sandy nature when dry, or the lumps minutely divided by the effects of rain and frost, are rendered liable to be washed off the ground (particularly where there is a declivity,) by the heavy fall of autumnal and winter rains. Hence, they should be laid on in the months of January or February, when the succeeding rains will sufficiently incorporate them with the land, which at that season is loosened, and lightened by the frost.

Soaper's ashes, are an excellent addition to any compost dunghill, which will be greatly enriched, by mixing one load of ashes, to every ten loads of compost.

Cattle

Cattle, of all sorts, prefer pastures manured with soaper's ashes, to any other, which I impute to the effects of the alkaline salts which they contain. Horses, and horned cattle, may be safely permitted, and will greedily eat the crops, that succeed the manuring.

Sheep, are liable to a disorder called the rot, from feeding on any newly manured, luxuriant herbage, the greatest care should be taken, not to let them be admitted upon such land, until the second year after it is manured.

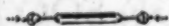
When too great a quantity of soaper's ashes are applied at one time, the grass will be burnt up ; and the succeeding crop, if not entirely destroyed, will be greatly injured. Hence, it is more prudent to manure with one hundred and sixty bushels per acre in one season, and the same quantity two or three years after ; than to lay
on

on, three hundred, or more bushels at one manuring. By the first mode, the effects will continue, and visibly appear for fifteen years, on lands that are naturally dry, or that have been previously drained.

Brandy, (as one of the numerous and various articles used by man,) when seasonably and moderately applied, is very salutary; but when used to excess, becomes very hurtful. Hence, is similar to the immoderate use of soaper's ashes, or any other manure.

Thistles, and other luxuriant weeds, cut close to the ground, are destroyed by scattering soaper's ashes over the bleeding stumps, immediately after they are cut.

OF WOOD ASHES.



WOOD ashes, contain fixed alkaline salts, and absorbent earth, attract moisture, and inflammable matter, from the atmosphere, and keep the earth in an open state. Lime, deprives wood ashes, and other alkalies of their fixed air, increases their power for the purposes of a caustic, and enables them more readily to dissolve oils, and mucilaginous particles.

Wood, and all other vegetable ashes, from whatever vegetables they have been produced, are of one and the same quality, for the purposes of agriculture; and should (when conveniency permits) be kept perfectly dry, till they are used. When exposed, to the rains, the salts are washed out, and

and of course, the ashes are not so efficacious.



OF SOOT.



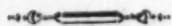
SOOT, is a composition of fixed and volatile alkaline salts, oils, and a small quantity of calcarious earth, arising from the fuel with the smoak; or may rather be deemed the smoak itself, gathered and fixed on the side of chimnies.

Soot, is a most excellent top dressing for grain of all sorts, and for cold stiff pastures; it destroys moss, and kills insects. When it can be procured on reasonable terms, it is a cheap and effectual manure; but should never be applied in a dry season, as it will injure the blades of corn or grass. The most proper quantity is, from
twenty-

twenty-five to thirty bushels per acre, sowed early in the spring, before rains, which wash it off the leaves of plants into the ground; and its sudden effects will soon be perceived, by the deep green, and luxuriant growth of the crops.



OF COMMON SALT.



COMMON salt, produced from sea water and springs, is originally the same; differs in strength and some other qualities, according to the operation by which it is made; the quicker the liquor is evaporated, the weaker is the salt: When the liquor is evaporated over a strong fire, part of the strength, or acid of the salt is raised with it. Hence, the more gentle the process, the stronger is the salt.

Salt

Salt, is not beneficial to vegetation ; when decomposed by being mixed with a proper compost, it may then assist to promote vegetation ; but the advantages arising therefrom to farmers in general, cannot be adequate to the expence.

OF SEA SAND.

SEA sand, is a good manure for all soils, particularly, sands, and light sandy lands. When carried immediately from such parts of the shores as are daily overflowed by the tides, it is saturated with strong salts, of an alkaline nature, and putrid matters, which the sea waters contain. It adds tenacity to such light soils, by the putrid saline particles attracting, and retaining moisture, which, having undergone no operation of the fire, conveys its original properties in their natural

tural state. Hence, it differs materially from common salt.

OF SEA WEED.

SEA weeds, contain alkaline salts and mucilage; they should never be applied without being first mixed with lime and earth, or with earth, to ferment and putrify, when burnt, they yield an excellent manure called kelp, containing vitrifiable earth, and a very strong alkali, soluble in water. It acts as vegetable ashes.

Weeds, and offals of a garden, when burnt, produce alkaline salt and absorbent earth. If not burnt, should be mixed with the compost dunghill. When the seeds of weeds are formed, it is essentially necessary the weeds should be burnt, to prevent their

their seeds from ripening, and being conveyed into the ground with the manure. As couch, and some other weeds vegetate, at every joint or knot, they likewise should be burnt.

OF SHELLS OF SEA FISH.

SHELLS of sea fish, and all others, are composed of calcarious earth and salts. When applied in their natural state, continue a long time without dissolving. When burnt, are converted into lime.

OF CHALK.

CHALK, is an absorbent earth, containing neither oil nor salts; but when incorporated

incorporated with the earth, it attracts acids, oils, and salts.

OF MARLE.

MARLE is composed of calcareous earth, clay and sand; is increased in value, according to the quantity of calcareous earth it contains, and is best adapted for sands and light soils. The quantity applied, should be in proportion to the lightness of the land.

OF BRICK, AND LIME RUBBISH.

BBRICK, and lime rubbish, are good manures for cold arable lands; are absorbents, and lighten the soil.

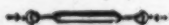
D

OF

OF SAW DUST

AND

TANNER'S BARK.



SAW dust, Tanner's bark, and rotten leaves, are best adapted, for the compost dunghill, and good for all soils.



OF ANT HILLS.



ANTS, are evidently known to be very injurious to lands, particularly pastures. Observations instruct me, that they multiply and increase most in cold clayey, or such other

other soils as contain the greatest acidity. The hills they raise, produce but a very small quantity of such coarse grass, as no animal choose to eat. The longer these hills are permitted to remain on the soil, the more they are extended over the surface, and increased in number. Hence, the ground they occupy is so much land, lost to the farmer; and on lands that are mowed, these hills and hillocks, quickly blunt the edge of the mower's scythe. The heavy falls of autumnal rains that saturate the earth, oblige these sagacious, but injurious insects, to ascend from under the surface of the ground, into a higher situation in their mansions, which are most conveniently constructed, for their residence and defence from rains. The vernal heat of the sun, does also influence them to occupy their upper apartments. The season best adapted for their destruction, is the month of November and December, when the earth is frequently filled with

water; their hills should be pared off, rather lower than the surface, and immediately carried to the dunghill, or mixed with lime or soaper's ashes, where the eggs, and insects, will be converted into a rich manure. Should any of the ants remain under the ground from whence the hills were taken, their passages will be so open and exposed, as readily to admit the rains and frosts; when a small quantity of soaper's ashes; foot, or lime fresh flaked, sowed over, will effectually destroy them, and soon produce a sweet herbage. A woman or boy can cover a great quantity of such pared ground in a short time, and at a very inconsiderable expence.

In the months of April or May, as the heat increases, these insects are also influenced to ascend their upper apartments, for to enjoy the sun's enlivening powers; at such seasons, they, and their hills, should be cut, carried off, and managed as before directed.

rected. The bare spots should be sowed with grass seeds and white clover, raked in, which will soon vegetate.

Three advantages result from such conduct; the land is made even, the insects are destroyed, and a rich addition, far superior to common earth, is procured for the compost dunghill.

I entirely disapprove of the methods generally made use of in Gloucestershire, and many other parts; which, are the quartering, or paring off the tops of the hills, digging out the insects and eggs, which are scattered over the ground, and the surface of the hills replaced on the parts from whence they were cut. By such modes, in lieu of levelling the lands, hollows, or holes remain on such parts of the ground, and the ants are not destroyed, but dispersed over the soil, to form new colonies, more numerous than before.

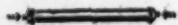
OF THE MUD OF POOLS, &c.



MUD of pools, ditches, ponds, and rivers, is composed of the washings of high roads, the dung of geese and ducks, dung and urine of cattle, dead animals, and rotten vegetables, all which putrify and become a good manure. It should be mixed with dung, soaper's ashes, or with lime,



OF WOOLLEN RAGS, &c.



WOOLLEN rags, cuttings of leather, particularly the refuse of skinners and tanner's yards; with hair, and bones ground or powdered; are exceeding good manures, containing

containing mucilage, oils, and alkaline salts.



OF DEAD ANIMALS.



DEAD animals, should be buried in a dunghill, where they will corrupt, putrify, and greatly enrich it; they contain oils and salts.



OF URINE.



HUMAN, and animal urine, are composed of water, oil, and salt. Human urine should be carefully preserved in casks or tubs, and if not used by itself as a manure, should be thrown on the dunghill.

All kinds of urine, when recently applied, are very acrid, and rather hurtful to vegetation. When stale, their acrid properties, are corrected by fermentation, and then they contribute greatly to fertilization.

Stale urine, and barton draining, are greatly preferable to dung for fruit trees, as penetrating better to their roots, and not harbouring insects; whereas dung secretes worms and insects, that are conveyed to the roots of the trees with the dung, which mixed with the mould, undergo a second fermentation; and thereby the worms and insects acquire such strength, as to make the tender roots and fibres of the trees, part of their food. Hence, trees being deprived of great part of their grand resources, (which are conveyed to them through the pores or mouths of every root and fibre,) become diseased, and frequently die.

Another

Another disadvantage attends the application of dung, and dead animals to the roots of trees; these manures are very improper, as they harbour worms and insects, that attract moles and other vermin, which do much injury, by breaking the roots and tender fibres of the plants, and by making hollow passages, which admit the cold air and frosts in winter, and the scorching heat in summer. Hence, trees and plants become sickly, and are rendered incapable of producing luxuriant crops.

When trees are manured with dung, the wheeling or carrying it greatly injures the walks, and is attended with much trouble and expence. Whereas, stale urine and barton drainings, contain the real essence of the dung, without supplying food for the increase and nourishment of worms and insects; and the work is executed, with very little trouble and expence.

Human

Human urine, is the richest, as containing more salts and oil than any other. As great quantities may be collected in cities and towns, it should be kept in casks to ferment; if mixed, when stale, with piles of earth, it will form an excellent compost, far superior to dung, for gardens and other ground. Stale urine, applied by watering pots, over the trenched garden grounds, after being levelled in the spring, will kill worms and insects, and prove an exceeding rich manure, entirely free from weeds. Gardeners in particular, would very soon experience the greatest advantages by adopting such mode; and immense quantities might be saved of a most valuable manure, which is thrown away and deemed as useless.

OF

OF SOAP SUDS.



SOAP, is composed of vegetable or animal oil, alkaline salts, and lime, by which their original textures are altered and become so combined, as to be easily rendered miscible with water. Hence, soap suds are converted into an excellent manure for fruit trees and flowers.



OF MALT DUST.



MALT dust, is an exceeding good top-dressing for corn, and meadows in the spring. Dung, and other manures plowed in, loosen and divide the soil, and are beneficial to succeeding crops. Whereas top-dressing

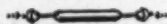
dressings principally nourish the plants, and supply food for those crops only, on which they are laid, without loosening or dividing the soils, or being beneficial to succeeding ones. From twenty to forty bushels per acre, (according to the poverty or richness of the soil) is the most advantageous. When too great a quantity of malt dust is applied to corn, the straw grows so luxuriant, as to be beaten down, and laid by high winds and heavy rains.



OF A NEW, CHEAP,

AND

EFFECTUAL ALKALINE MANURE.



LANDS, adjoining to cities and large towns, may be manured on very reasonable terms; and according to the distance, so
in

in proportion is the expence of carriage increased.

Lands, situated in the interior parts of the country, are in general manured only, with the dung arising from the cattle, and sheep folded on the grounds; the quantities thus obtained, are very insufficient, for the purposes of prosecuting an advantageous cultivation.

All, or most countries, produce either wood, goss or furze, heath, or peat, frequently called turf, which are used for firing; their ashes are thrown (from a want of knowing their real value) into some open place, where they are exposed to rains, which wash away their salts and fertilizing properties. The great advantages of manures, particularly, where the distance is too far, to procure them from cities or towns, must be too obvious to the

the discerning Agriculturist, to require any comment.

The alkaline and new manure, which I have experienced to be inferior to none, I make as often as I can procure materials, in the following manner, viz. Having collected from the sides of ditches and from commons, a quantity of rubbish, wood, briers, &c. stems and roots of weeds, stalks of beans, and garden offals, which are burnt, and the ashes sifted; such cinders as are not thoroughly consumed, undergo the second operation of the fire, are again sifted, and immediately carried into a house to prevent the bad effects of rain; and to every four bushels of the ashes, or in proportion, I add one bushel of quick lime, on which is thrown as much stale urine, or barton draining, as will thoroughly slake it; when the whole is turned and mixed as often as is necessary, so that the lime and ashes may be completely incorporated.

The

The ashes of all vegetables are vitrifiable, and frequently found to contain metallic particles. Quick, or fresh burnt lime, is freed from fixed air, its corrosive and acrimonious properties are so great, as to decompose metallic particles, as also to deprive alkalies of their fixed air, and disunite their texture, by which their powers are so much encreased, as to be the more readily enabled to dissolve oils, &c. for the purpose of making soap. Hence, in a similar manner, they unite with, and dissolve the oleaginous particles in the earth, by which the oils and salts are rendered miscible with water, and thereby converted into a most nutritive food for vegetables. When lime is exposed to the air, (even in a house) it will absorb moisture, fall into a powder, attract fixed air, and by degrees lose its corrosive and acrimonious powers. Ashes, also attract moisture, &c. Hence, if the alkaline manure is not immediately used, it should be carried into a loft, or some dry place,

place, well covered, and kept as close as possible from the air, by which its virtues will be retained. If used as a top-dressing for wheat, eight or ten bushels per acre, sowed in the months of November, or December, when the manure will be soon washed into the earth, will nourish and keep warm the roots of the plants, kill insects, and greatly fertilize the land, for that, and succeeding crops.

When applied to barley, it should be sowed very early in the season, for reasons already given under the section of foot.

When applied to pastures, the land should be first harrowed with fine harrows, in the month of January, or February, and from eight to twelve bushels per acre, regularly sowed over. The harrows will loosen the soil, admit the air and manure, to the roots of the grass; their effects will
soon

soon become visible, and continue for some years.

When applied for a compost, twenty bushels or more (according to the nature of the soil,) may be mixed and thoroughly incorporated with sixty bushels of earth to an acre, and applied in the same manner as lime.

Peat, or turf ashes, mixed with lime, act as wood ashes and lime ; but as peat ashes contain less salts, a greater quantity should be applied.

Sea shores, produce great quantities of weeds, which, when burnt, become a solid substance called kelp, containing strong alkaline salts, and calcareous earth. Such ashes pulverised and sifted, act in the same manner as wood ashes, and lime mixed together.

E

Barilla,

Barilla, is a weed cultivated in Spain and Italy ; when burnt, it is converted into a solid substance, containing alkaline salts and calcareous earth. One pound of Barilla, contains much more alkaline salts, than one pound of kelp.

As the properties of kelp (and particularly Barilla, as being much stronger) are very corrosive ; I recommend their being mixed with earth in a compost, in preference to their being applied alone. For the earth will correct, or rather the viscosity therein contained, be corrected, and be converted into an excellent manure.

When wood, weeds, &c. are burnt in the open air, the volatile salts, oils, and part of the calcareous earth, ascend in the form of smoke, into the atmosphere.

Where large quantities of rubbish wood, weeds, &c. can be procured, a small building

ing sixteen feet long, twelve feet high, and twelve feet broad, or of any other size, covered with an arch or dome, with a high and narrow chimney, might be erected at a very inconsiderable expence. The rubbish wood, &c. should be burnt therein, the volatile particles, and calcarious earth, would be preserved on the dome and walls, in the form of foot; the ashes would be kept dry, and the Agriculturist would in a short time, be fully repaid such expences.

OF NATURAL PHILOSOPHY.

NATURAL Philosophy, is the knowledge or study of natural productions, founded on reason and experience. By studying the qualities of natural bodies, in relation to their generation, motion, or other properties, the wonderful works of the creation are discovered to our view, that we may with chearful and divine contemplation, sensibly feel, and gratefully acknowledge, the mysterious works of providence.

God bestowed upon man the earth, that he might employ his time, by labour and understanding,

understanding, in replenishing and subduing it.

By labour, to cultivate the ground ; such employment makes him strong, active, and healthy.

By understanding, to study the most beneficial methods of replenishing, and applying such manures as are most effectual, for subduing and correcting its cohesive and injurious particles ; that he may, by his industry and knowledge, be best enabled to supply the wants of nature.

Providence, most wonderfully assists the industry of man, by celestial and atmospheric influences, which greatly tend to enrich the earth, and to promote vegetation.

OF THE SUN.



THE Sun, is the principal source of heat, as well as light, without which, all bodies would become rigid, lifeless and fixed, Hence, animalization and vegetation are promoted, and the ocean and atmosphere, continue in a fluid state.

Heat, contributes materially to promote the growth of plants; vibrates the parts of bodies; excites and promotes a motion in the fluids; resolves the watry and oily particles of the earth into vapour; rarifies the juices of vegetables; exhales the putrid, volatilized, sulphurous, saline, and inflammable particles from dunghills, other corrupted bodies, and from smoak. Part is absorbed by vegetables, which adds to their increase: the remainder ascend and float in the atmosphere, where being combined,

bined, are formed into a saline subtile oil, which by the summer showers and dews, are converted into nutriment, returned into the earth, and absorbed by the leaves and roots of plants.

The life, and growth of animals and vegetables, depend on a certain degree of heat, which every year confirms. As the heat decreases in autumn, so in proportion, vegetables lose their verdure. And as the sun's enlivening powers, return in the succeeding spring, every plant will earlier or latter recuscitate, and accordingly grow to maturity.

Excessive heat, without moisture, is injurious to vegetation; as more nourishment is exhaled from the earth and plants, than is returned by that condensed vapour, which falls in the form of dew.

By a defect of heat, the circulation of the sap becomes languid and cease; and

according to the continuation of the cold drying winds, (without the intervention of rain or dew) so proportionably, is the perspiration and circulation or motion of the juices stopped, in the tender blossoms, leaves, and branches; the perspiring matter, thereby adhering to the external parts, is converted into a mucilage, that harbours insects, (which are the *Effects*, but not the *Cause* of BLIGHTS,) similar to all corrupted animal bodies, which naturally secrete worms.

It frequently happens, that one part of a tree is suddenly scorched and shriveled, by a sharp hoary frost, or cold wind, which stops the weak motion of its juices; while the other part appears healthy and in full verdure. Such effects arise, from inward weakness, the want of sufficient moisture or nourishment, or from some bad quality in the soil or stock.

Soap Suds, stale urine, or barton drainings, applied to the roots of trees, after the earth

earth has been dug, or loosened, instead of secreting and nourishing, destroy worms and insects; keep the roots of trees warm in winter, and by their saline and oily particles, attract and retain moisture in summer. Hence, are the most effectual preservatives against blights, and other diseases. In wet seasons, those manures may be freely used, as the rains will sufficiently correct them, when too strong; but in dry weather, they should be properly diluted with water.



OF FROST.



FROST, is the most severe effect of cold, but a great fertilizer of land, particularly, all stiff and clayey soils. It answers
several

several purpose ; it locks up the surface of the earth, prevents the carrying off that substance necessary for vegetation, checks the growth of weeds, prevents the hatching of insects and destroys them, lightens the earth, expands the moisture, and breaks down the texture of the soil into the most minute particles.

White frost, is no more than dew frozen, which does not injure vegetables materially.

OF HAIL.

HAIL, is drops of rain frozen in their passage through the atmosphere. The greater the height they descend from, the greater is the resistance they meet with from air, and the more globular and smaller is the
the

the hail. Hence, vice versa, the less the height of their descent, the less is the resistance they meet with in the air, of course the less globular and the larger is the hail. It is very hurtful to vegetation, by beating the farina or blossoms off the corn and trees.

OF SNOW.

SNOW, is a meteor engendered in the air, by moisture and cold ; contains no nitre nor any other salts, leaves nothing that chrystalizes after dissolution ; but contains inflammable matter, and makes the common air more noxious and unwholesome than before.

Snow, fertilizes the ground, by preventing the escape of what nourishes plants, protects

protects corn, and other vegetables, from the intenser cold air and piercing winds, and keeps their roots warm.

OF LIGHTNING.

LIGHTNING, is generally supposed, to be a mixture of sulphureous and nitrous effluvia, which ferment, kindle, and occasion those explosions and vivid flames of fire, which we call thunder and lightning; and is, in the hand of Providence, in some respect, similar to what electricity is in ours.

Lightning, does much more good, than hurt to vegetation, it frees the atmosphere from sulphureous, and other noxious particles, and produces cold. Hence, the watry vapours floating in the air are condensed,
and

and descend in the form of rain, which greatly fertilize the land.



OF DEW.



DEW, is a compound of moisture, oily, saline, and volatile particles, exhaled by the great heat of the sun from the sea, rivers, standing waters, marshy lands, the earth, dunghills, and other putrid matters; all which are attracted by the wonderful power of the solar rays, and carried into the atmosphere, where they float, are intimately united, and kept in agitation by the heat of the sun, and become invisible. But when the solar heat begins to remit, and as the air cools, the watry compound particles are condensed, and fall upon the earth and leaves of vegetables. The stronger the heat of the sun, the greater is the exhalation,

exhalation, and fall of dew at night. As the sun ascends above the horizon in the summer, the exhalation, particularly of standing waters, and marshy lands, is extremely visible.

In the driest and warmest seasons, when the earth is parched and dried up, then Providence most wonderfully assists and promotes vegetation, by the fall of dews on the leaves of trees and vegetables. As the heat of the sun increases, it excites, and promotes a motion in the juices; the leaves imbibe the fertile pearly drops, and convey them through the vessels by which vegetables are nourished.

OF

OF CLOUDS.



CLOUDS, are a collection of vapours, exhaled from the sea, other waters, and from the land, by the sun, or subterraneous heat, or both, which when exhaled, are too small to be perceived; but when they ascend into that region of the atmosphere of the same specifick levity, there they float, are driven together by the agitation of the winds, condensed by the cold, and rendered opaque by the union of their parts. Hence, they visibly appear in the form of clouds, which being heavier than the air, of course fall through it; and according to the height they descend from, and the resistance they meet with from the atmosphere, are broken and divided into proportionably small drops, called rain.

OF

OF RAIN.



RAIN, is a precipitated cloud, broken and divided into innumerable drops. The greater the height they descend from, the greater is the resistance they meet with from the air, the more are they divided, and lesser are the drops of rain. Hence, vice versa, the less the height of their descent, the lesser is the resistance they meet with in the air, of course, the larger are the drops of rain.

Vegetables, cannot grow without water. Rain, promotes vegetation, by furnishing salts and oils from the atmosphere, by dissolving and uniting the oily and saline particles in the earth, by expanding the imbibing vessels, by attenuating the glutinous substances, by promoting the intestine motion

motion of the juices, by loosening the earth that the roots of plants may enjoy access of air, and be better enabled to extend themselves in search of those nutritive particles, conveyed to them by means of heat and that most useful watry menstruum.

Excess of rain, is hurtful to vegetation, particularly, when waters remain any considerable time on the ground, which lessen the warmth in the earth, and thereby prevent vegetation; or destroy the roots of plants, and render such places barren; or produce such rank unwholsome weeds as are nourished by stagnated waters, which become putrid by the heat of the sun.

Too much moisture, yields a thin and vitiated food, prevents the access of air to the roots of plants, impedes their natural
F growth

growth, and prevents their seeds from being perfected.

If heavy rains fall when the plants are in bloom, their farina is washed off, and consequently there can be no impregnation. Hence, wet seasons produce the smallest crops.

The want of rain is also hurtful to vegetation. Heat dissipates the moisture in the earth, which becomes too dry. Hence, it is baked and rent by the scorching rays of the sun, which destroy the roots of plants; or so harden the earth, as to prevent the fibres from extending themselves in search of food.

OF AIR.



AIR, is an invifible thin elastic vapour, imperceptible to all our fenfes, except that of feeling.

The colder the weather, the more is the air condensed, whereby the heat of fires are more confined, and become ftronger in winter than in fummer.

When water is converted into vapour, by diftillation or exhalation, the water becomes lighter than the air. Hence, watry vapours are raifed to a confiderable height, and float in the atmofphere; where its weight, density, and preffure, is lefs than near the furface of the earth.

Moist vapours, lessen the elasticity of the air, because the force of repulsion in the particles of watry vapours, is less than in the particles of air.

A moist atmosphere, is heavier than a dry and clear atmosphere, in proportion to the quantity of suspended watry particles; and according to its component parts, its weight varies, which barometers discover.

The elasticity of air, is increased by heat, and decreased by cold. Hence, appears the use of thermometers, which indicate the various degrees of both.

Air, is absolutely necessary for the support of animal and vegetable life; without it, there could be no existence, which experiments with air pumps sufficiently demonstrate. No seed can vegetate, nor vegetable grow in any place deprived of air.

Fresh

Fresh air is impregnated with a particular vivifying spirit, essentially necessary to the preservation of animal life.

Every time the air passes out of the lungs, part of the vivifying spirit is either destroyed or left behind. Hence, animals die when confined in noxious air, as well as from want of air.

Air, is changed by the corruption and putrefaction of the vivifying spirit; as the properties of things putrified, are different from the properties they contained before putrefaction, so in proportion, is the health of animals affected. Hence, arise epidemical diseases amongst the inhabitants and animals of such countries, as are marshy, and are surrounded or intersected with stagnated waters, which of course putrefy and destroy the vivifying spirit in that air.

The different effluvias, diffused through the air, produce a variety of different effects.

In all large cities, the air abounds with sulphureous, acrid, and corrosive particles, which rust metals sooner than in the country ; and near mines of copper, its effects are so great, as to discolour silver and brass.

Air, not only acts upon all bodies, by its common properties of weight and elasticity, but also by the peculiar qualities of the ingredients whereof it is composed, greatly promotes vegetation ; for the more vegetables enjoy the free access of air, (not only to their leaves, stalks, and branches, but also to their roots) the more they grow and thrive. Such is the vivifying power of air, that it was considered by the ancient philosophers as the first principle of all things.

As the learned and ingenious Dr. HUNTER, of York, first made those important and interesting discoveries, relative to the putrid and noxious particles of the air being

ing consumed by the vegetable creation, and which were published in the year 1769 and 70. I will beg leave to present the reader with such extracts as are necessary for my present subject.

“ It is pleasing to observe, how the dissolution of one body, is necessary for the life and increase of another. All nature is in motion. In consequence of the putrid fermentation that is every where carried on, a quantity of vegetable nutriment ascends into the atmosphere.— Summer showers return much of it again; but part falls into the sea and is lost: to this we may add the animal and vegetable substances consumed on board of ships, all of which are buried in the ocean. The industry of man restores them to the earth; and we may presume that the fish taken from the sea, leave a balance in favor of mankind. Thus Providence, with the most consummate wisdom,

“ dom, keeps up the necessary rotation of
“ things.”

Dr. Hunter's Georgical Essays, Vol. II. P. 135.

“ Hitherto I have considered plants as
“ nourished by their roots. I shall now
“ take a view of them as nourished by
“ their leaves. An attention to this part of
“ the vegetable system, is essentially neces-
“ sary to the rational farmer. Vegetables,
“ that have a succulent leaf, such as vetches,
“ peas, beans, and buck wheat, draw a
“ great part of their nourishment from
“ the air, and on that account, impoverish
“ the soil less than wheat, oats, barley, or
“ rye, the leaves of which are of a firmer
“ texture. Rape and hemp, are oil-bearing
“ plants, and consequently impoverishers
“ of the soil; but the former less so than
“ the latter, owing to the great succulency
“ of its leaf. The leaves of all kinds of
“ grain are succulent for a time; during
“ which

“ which period the plants take little from
“ the earth ; but as soon as the ear begins
“ to be formed, they lose their softness,
“ and diminish in their attractive power.
“ The radical fibres are then more vigo-
“ rously employed in extracting the oily
“ particles of the earth, for the nourish-
“ ment of the seed. Such, I apprehend, is
“ the course of nature.”

Ibid. Vol. I. P. 57.

“ In order that we may have a distinct
“ view of the motion of the sap, it will
“ be necessary to reflect, that the root,
“ stem, branches, and leaves are constructed
“ in the same manner. Sallows, willows,
“ vines, and most shrubs, will grow in
“ an inverted state, with their tops down-
“ wards in the earth. Dr. BRADLEY,
“ describes the manner of inverting a young
“ cherry tree, the roots of which will put
“ forth leaves, and the branches become
“ roots. Hence, it is obvious that the nu-
“ tritive

“ tritive matter may be conveyed as well by
“ the leaves, as the roots, their vascular
“ structure being the very same.”

Ibid. Vol. I. P. 168.

“ Air is to be found in every portion of
“ earth ; and as it always contains a solution
“ of the volatile parts of animal and vegeta-
“ ble substances, we should be careful to
“ keep our stiff soils as open as possible to
“ its influence. It passes, both in its ac-
“ tive and fixed state, into the absorbent
“ vessels of the root, and, mixing with the
“ juices of the plant, circulates through
“ every part. Dr. HALEs, in his statical
“ experiments upon the vine, discovered it
“ ascending with the sap in the bleeding
“ season.”

Ibid. Vol. I. P. 180.

In the year 1773, the ingenious and in-
defatigable Dr. PRIESTLY, presented to the
Royal

Royal Society, his experiments on the different kinds of air, which clearly proves, that putrid air arising from dunghills, and that the perspiration of animals, are not only absorbed by vegetables, but also add to their increase. As those experiments are of too interesting a nature to be passed over unnoticed, for the benefit of those who have not had an opportunity of seeing the original, I shall here transcribe part, referring the curious, to the learned Doctor's publication.

“ When air has been freshly and strongly
“ tainted with putrefaction, so as to smell
“ through the water, sprigs of mint have
“ presently died, upon being put into it,
“ their leaves turning black ; but if they
“ do not die presently, they thrive in a most
“ surprising manner. In no other circumstances have I ever seen vegetation so vigorous as in this kind of air, which is immediately fatal to animal life. Though
“ these

“ these plants have been crowded in jars
“ filled with this air, every leaf has been
“ full of life ; fresh shoots have branched
“ out in various directions, and have grown
“ much faster than other similar plants,
“ growing in the same exposure in com-
“ mon air. This observation led me to
“ conclude, that plants, instead of affecting
“ the air in the same manner with animal
“ respiration, reverse the effects of breath-
“ ing, and tend to keep the atmosphere
“ sweet and wholesome, when it is become
“ noxious, in consequence of animals either
“ living and breathing, or dying and pu-
“ trefying in it.

“ In order to ascertain this, I took a
“ quantity of air, made thoroughly noxious,
“ by mice breathing and dying in it, and
“ divided it into two parts ; one of which
“ I put into a phial immersed in water,
“ and to the other (which was contained in
“ a glass jar, standing in water) I put a
“ sprig

“ sprig of mint. This was about the be-
“ ginning of August 1771, and after eight
“ or nine days, I found that a mouse lived
“ perfectly well in that part of the air, in
“ which the sprig of mint had grown, but
“ died the moment it was put into the
“ other part of the same original quantity
“ of air; and which I had kept in the very
“ same exposure, but without any plant
“ growing in it.—This experiment I have
“ several times repeated, sometimes using
“ air in which animals had breathed and
“ died; sometimes using air tainted with
“ vegetable or animal putrefactions, and
“ generally with the same success.”

Dr. Priestley's Experiments and Observations on
different Kinds of Air. Page 86.

ON

ON THE IMPROVEMENT

OF

WET LANDS.

THE first, and principal improvement of wet land, is draining ; without which, the greatest quantity of the best manure will prove ineffectual. Coarse grass, rushes, horse-mints, and other noxious weeds, are the general productions of lands overcharged with moisture, proceeding from the water being retained by a stiff impervious clay, or from cold hungry springs, which are frequently loaded with minerals and acids ; and from want of proper drains

the

the stagnated waters corrupt the natural nourishment, so essentially necessary for producing sweet herbage: but when the cause is removed, the effects will cease. Those luxuriant, noxious weeds, being deprived of their nourishment, of course die, and sweet wholesome herbage naturally succeed, without manure.

The greatest attention, should be paid to the situation and declivity of the ground; the ditches, at the lowest part of the land, should be first opened of a sufficient depth and size, (according to the nature of the soil,) at least three feet perpendicularly deep, two feet wide at the bottom, and four feet wide at the top, gradually increasing from the bottom to the surface; which slope will prevent the sides from falling in with rains or frosts.

In a stone-brash clay, my main or leading drains are made, (according to their declivity,)

clivity,) from twenty to twenty-four inches deep, nine inches wide at bottom, and from fifteen to eighteen inches broad on the surface; extending through the most hollow, and from the lowest to the highest parts of the land. The branches, or smaller drains are from twenty to forty, or fifty feet a-part, (in proportion to the springs and wetness of the soil,) cut a-cross the ground with a hanging level, sufficient to convey the water into the large drains; the small drains are made narrower, and more shallow than the main drains.

Stones, are the most effectual for this purpose: when the work is properly executed it will last for ever. The best method I have experienced is, to place flat stones, standing on the bottom as perpendicular as the sides of the drains will admit, with other flat stones on the opposite side, placed with the top part to rest against the upright stones, in the form of

A
Should

Should this cavity be insufficient for the current water, another flat stone may be placed in a reversed form, as *A* by which there will be a double vacuum, fully sufficient for the greatest current; the remainder of the drains, when in arable lands, are filled up with stones, to within about eight inches of the surface, covered with straw or stalks of beans, to prevent the earth from falling between the stones, and filled up with the mould out of the drain; the remainder is scattered over the land. In draining pasture lands, the turf is carefully laid a side, the drains filled with stones to within four or five inches of the surface; and the grass part of the turf is placed thereon, which saves the trouble of laying straw, and as effectually prevents the earth from falling between the stones into the drains.

The effects of draining are too obvious to require any comment. The general price

G

in

in Gloucestershire, is six-pence per perch for cutting and compleating the drains, three-pence per load for the stones raised out of the ditches ; every perch of draining takes about half a load. The expence of halling, must be governed by the distance they are halled from ; but on an average, may be rated at about four-pence half-penny per load, of a ton and a half to two tons weight ; all which expences, amount in the whole, to about one shilling per perch. When a sufficient quantity of stones cannot be procured from ditches, the general price of digging is six-pence per load. Hence, the total expence is fifteen-pence per perch. And after the land is drained, the manure laid on will prove effectual.

OF

OF CLEARING LAND

FROM

TREES, &c.



THE next improvement, is the clearing of lands from the stumps and roots of trees, thorns, briars, &c.

When lands are encumbered with many timber and pollard trees, they are very injurious to pasture and arable grounds: they obstruct the free circulation of the air and the effects of the sun. The leaves, particularly of ash, render the grass whereon they fall coarse and sour; which when eaten by cows, affect their milk with a strong disagreeable taste. Trees attract, their shade and root retain, moisture and

G 2

acidity

acidity in the soil ; their wide-extended fibrous roots, particularly of ash and elm, strike horizontally, near the surface, to a very considerable distance ; they greatly impoverish pasture-grounds, and impede the plow in arable land. The roots of trees grow in proportion to their trunks and branches ; therefore, no more than two or three should be left in a field, for cattle to rub against, and for shade.

When trees are planted, or permitted to remain for timber or for firing, the northern and eastern sides of fields and irregular corners, are the most proper situations ; where they afford shelter, and serve as a screen against cold winds ; and do not obstruct the influences of the sun and air.

The price of grubbing up trees with their roots, is from nine-pence to eighteen-pence, in proportion to their size. The tops and butts of ash and oak are more advantageous for burning into charcoal, than if sold for firing.

firing. The expence and general produce I have inserted as under.

The measure of a cord of wood in Gloucestershire, is eight feet four inches long, four feet four inches high, and two feet two inches broad. The price of cleaving is from twenty-two-pence to two shillings and three-pence per cord, varying in proportion to the roughness of the wood.

Expences attending the Burning of one Hundred Cords of Wood: viz.

	£.	s.	d.
To the collier for building his cabin,	0	5	0
Burning of 263 sacks, at 6d. - -	6	11	6
Halling 263 sacks to market, ditto	6	11	6
Unloading, - - - - -	0	12	0
Wear and tear of sacks. - - -	3	10	0
One hundred cords of wood,			
generally sold for firing, at	30	0	0
per cord, 6s. is - - -			
Total Expences	47	10	0
G 3			
PRODUCE			

PRODUCE.

263 sacks of nine bushels each,	}	£.	s.	d.
6½d. per bushel, is 4s. 10½d.		64	2	1½
per sack, - - - - -				

Deduct expences, as before, 47 10 0

Balance, in favour of burning for	}	16	12	1½
charcoal - - - - -				

Exclusive, of twenty cart-loads of charcoal ashes, which I have experienced to be hurtful to vegetation, when applied alone; therefore, the largest or coarsest parts of the ashes, should be burnt in an open fire, with weeds, briars, &c. by which the inflammable part of the coal will be destroyed, and an alkaline salt will be procured. The finest parts of the charcoal ashes or dust should be mixed with the compost dunghill.

When lands are cleared from superfluous trees, &c. attention should be paid to the surface and condition of the ground.—

Where

Where ants inhabit, their hills should be pared off, (as before directed in p. 50,) carried to the middle of the field intended to be left for pasture, and there mixed with an equal quantity of soaper's ashes, or with one half the quantity of quick lime; when thoroughly incorporated, it must be spread on the ground (which should be previously harrowed,) in the proportion of about one hundred and sixty bushels to an acre.

By placing the manure in the middle of the field, it is the sooner, and at a less expence, carried over. But should there be any uneven head lands, or banks, such should be plowed and harrowed, the pared hills should be deposited thereon and levelled, the ashes or lime, should be laid on the middle of the bank, and as soon as the lime is flaked, it should immediately be mixed with the ant hills and head land; and when well incorporated, should be applied in proportion to the ashes or lime that has been added.

G 4

I have

I have repeatedly used lime, mixed with earth and with clay, on pasture; it freshened the soil for one year, but no visible amendment or increase of crops appeared after. But I have experienced, an addition of rotten dung, mixed with lime and earth, (which had lain a few weeks after being thoroughly incorporated, and then well mixed with the dung,) to be very effectual, more particularly when laid on pastures that had been previously harrowed; the utility of which is illustrated in p. 64.

Old pasture lands, or such as retain moisture by being too flat, are frequently much improved by plowing, and making proper ridges to throw off the water. Then an application of earth and lime, by being intimately blended with the soil, is rendered a good manure, and thus applied; it acts very differently to what it does when laid on pasture lands, where it is entirely exposed on the surface, and of course is rendered almost useless.

I must

I must beg leave to dissent from the common mode of mixing ashes or lime with earth, as a compost, particularly for stiff soils. When I apply lime, coal, or soaper's ashes to plowed land, I deem it unnecessary trouble and expence, to haul ten loads of lime to a head land or bank containing thirty loads, or in proportion, of earth, which must be turned, at least twice, to be properly incorporated; afterwards to load, carry out, and spread forty cart loads in lieu of ten. When a head land or bank requires levelling, it should be once plowed to loosen it, which will render it the easier for loading; then it may be carried over the land, where it will be mixed and equally pulverised with the soil by future plowings.

Coal, and soaper's ashes may frequently be carried to, and immediately spread out of the waggon over the land. Lime may also be laid in piles, and as soon as flaked
should

should be plowed in. Such saving must appear sufficiently obvious to any person that will take time to reflect. I am fully convinced that every soil must contain as sufficient a body for those manures to act upon, as the earth on the head lands; and that such mode of application is equal, if not more effectual. Therefore, when the ground is properly prepared for the reception of the above manures, they should be immediately applied without mixture. Certainly the depth of the soil cannot be materially increased by the addition of ten, or even twenty loads of earth per acre. It is the strength and property of the manure only, that can correct bad qualities, and enrich the land.

As a similar comparison, I will enquire, if a gallon of spirits mixed with a gallon of water for six months or more, then, afterwards mixed with nine gallons of water, can be stronger, or of a different quality to
one

one gallon of spirits applied immediately to the ten gallons of water? In answer, when a gallon of spirits has been mixed for some time with a gallon of water, and afterwards mixed with nine gallons more of water, part of the spirit must have evaporated during that period, and at the different times of mixing; consequently the water cannot be so strongly impregnated, as when the spirit is immediately mixed with the ten gallons of water.—Such are my ideas (founded on experience,) of the properties of lime when mixed with earth, as a compost.

OF

OF PLOWING

AND

HARROWING.



PLOWING, is the action of breaking up, opening and pulverising the soil, that the roots and tender fibres of the plants may be enabled to extend themselves in quest of food.

When the soil has been well loosened by deep repeated plowings and harrowings, its particles are minutely divided, and the roots of plants have liberty to spread freely. Hence, they are enabled to acquire such nourishment, as could not possibly be obtained when confined between large impenetrable clods of earth. Thorough plowing in a great measure supplies the want of manure, by keeping the earth in a loose state, ready
for

for the reception of the atmospherical influences.

DUHAMEL says, " It is much more profitable to increase the fruitfulness of land by tillage than by dung:—1st. Because only a certain quantity of dung can often times be had, the produce of twenty acres being scarcely sufficient to dung one; whereas the particles of the earth may be divided, and sub-divided, *ad infinitum*. The benefit that can be procured from dung, is therefore limited; whereas no bounds can be set to the advantages which arise from tillage.

" 2d. Most plants that are reared in dung, have not the fine flavour of those that grow in a good soil, which has not been dunged. Greens and fruits are seldom so good in the neighbourhood of great cities, where dung abounds, as in country gardens, where it cannot be so lavishly

“ vishly bestowed. But nothing is more
“ striking than the difference between
“ wine, produced by a vine, that has not
“ been dunged at all, and that which is
“ made from a vine that has been greatly
“ dunged.

“ 3d. Dung, which according to Mr.
“ TULL, acts by fermentation, causes in-
“ deed an internal division of the particles,
“ which may be of great use : but the
“ plow not only divides the particles, but
“ changes the situation, by turning the earth
“ upside down. The part which was ex-
“ posed to the influence of the air, and
“ dews, takes the place of another part
“ which is removed from underneath to the
“ surface, and the earth that is turned up
“ is penetrated by the rain and dew, and
“ by the rays of the sun ; all which greatly
“ conduce to render it fertile.

“ 4th. Dung

“ 4th. Dung harbours insects, which af-
 “ terwards feed upon the plants and spoil
 “ them. It is well known, that when
 “ lands are dunged, in which trees are
 “ planted, their roots are in great danger
 “ of being hurt by insects : and this is
 “ one of the chief reasons why florists banish
 “ dung from their gardens.

“ It is true that dung is equally bene-
 “ ficial to light and stiff grounds ; but the
 “ same may be said of tillage.

“ Too strong land, is that of which the
 “ parts are so close, that roots cannot pe-
 “ netrate them without great difficulty.
 “ Now, if roots cannot extend themselves
 “ freely in the earth, they cannot draw
 “ from it the food of plants, which, for
 “ want of that food, will droop and lan-
 “ guish. But when those lands shall have
 “ been divided by tillage, when their par-
 “ ticles shall have been so separated, that
 “ roots

“ roots are at liberty to extend themselves,
“ and traverse all those small spaces, they
“ will be able to supply the plants with
“ their necessary food, and they will thrive
“ apace.

“ Tillage, is equally beneficial to light
“ lands ; but for a contrary reason. The
“ fault of these lands is their having too
“ great spaces between their particles ;
“ and as most of those spaces have no com-
“ munication one with another, the roots
“ traversing the great cavities without touch-
“ ing the particles of the earth, draw
“ consequently no nourishment from it.
“ But when the particles have been broken
“ by repeated plowings, the lesser inter-
“ vals are multiplied at the expence of the
“ greater : the roots have liberty to extend
“ themselves, and they glide in, as it
“ were, between the particles, meeting
“ with a certain resistance which is neces-
“ sary

the

“fary to their taking in the nutritive juice
 “which the earth contains.

“Mr. EVELYN, quoting SIR HUGH
 “PLATT, says, That if you take a cer-
 “tain quantity of even the most barren
 “earth you can find, reduce it to a fine
 “powder, and expose it for a year to the
 “vicissitudes and changes of the seasons,
 “and influences of the heavens, it will
 “acquire such a generous and masculine
 “pregnancy, within that period, as to be
 “able to receive an exotic plant from the
 “farthest Indies, and to cause all vege-
 “tables to prosper in the most exalted de-
 “gree, and to bear their fruit as kindly
 “with us, as they do in their natural cli-
 “mates.” We are to suppose these exotics
 “to have their due degrees of heat and
 “moisture given them. To what shall we
 “ascribe this great fertility? To the great
 “division of the particles of the earth and
 the multiplication of their surfaces. “By
 H “this

" this toil," (*Viz.* pulverising the earth,)
 " adds he, "'tis found that soil may be so
 " strangely altered from its former nature,
 " as to render the harsh, and most uncivil
 " clay, obsequious to the husbandman,
 " and to bring forth roots and plants,
 " which otherwise require the lightest and
 " hollowest moulds. But what proves how
 " beneficial plowing is in strong lands, to
 " facilitate the passages of the water, of
 " the rays of the sun, and of the roots of
 " plants, is, that their fertility is some-
 " times increased by mixing them with sand
 " instead of dung. Sand itself affords no
 " nourishment : but by preventing the par-
 " ticles from returning, it produces the de-
 " sired good effects.

" It does not appear, that light grounds
 " require quite so many plowings. It
 " might even be feared, least by frequent
 " turnings of such lands, and exposing
 " their parts to the sun, they might be
 " exhausted.

“ exhausted. But though the sun robs the
“ earth of its moisture, yet few of the
“ particles fit for the nourishment of
“ plants are exhausted with it; and expe-
“ rience shews, that light lands are bet-
“ tered by being plowed; either because
“ the breaking and stirring of their parti-
“ cles, renders them fitter to receive the
“ moisture of rain and dew, to profit by
“ the influences of the air, and be pene-
“ trated by the rays of the sun; or that
“ the internal pores are better fitted for the
“ extension of roots; or again, because
“ frequent plowings destroy weeds, which
“ are more apt to grow in light grounds
“ than in strong, especially when they are
“ dunged.

“ To prove by an experiment what we
“ have just advanced with respect to light
“ soils: let one half of a field to be in-
“ differently plowed, and the other half to
“ be plowed extremely well.

H 2

“ Some

“ Some time after, and in dry weather,
“ let the whole field be cross-plowed.
“ The land of that half the field which
“ was thoroughly plowed, will be of a
“ darker colour than that of the other half,
“ which was but slightly plowed. This
“ shews the benefit the land has received
“ by plowing.

“ Some think to supply the want of
“ plowing by harrowing their land greatly
“ after it has been sown; but this way of
“ scratching the earth is of little service;
“ and when it is moist, the horses poach
“ and damage it considerably.”

Duhamel's Husbandry, p. 15.

In the year 1759, M. Delu gave five plowings to a wheat field, which had not been dunged; and, at harvest, had taller and finer corn there, than any the neighbouring grounds produced, which had been dunged and cultivated in the usual way.

I knew

I knew a farmer, who had not a sufficient quantity of dung to cover more than half his fallow, which he sowed with wheat; the other half he intended for barley, but was advised (rather than leave the ground uncropped) to give it two extraordinary plowings, and sow that also with wheat, which he did; and reaped a greater crop of better grain off the undunged, than the dunged land.

In short, the advantage resulting from thoroughly pulverizing the land is so great, particularly when plants are growing, that in some places it has been found fully to repay the expences, even, of hoing between corn sown broad cast.

In February, 1776, I purchased the lease of my farm of the person who occupied it; as I could not get possession till May, and wished to have a small field of three acres and a half (which I will call No. 1.)

H 3

plowed

plowed up as soon as possible, my *judicious, honest, and worthy*, tenant undertook the management of it to the best advantage. The soil was a loam from six to eight inches deep, on a stone-brash clay. Accordingly he plowed it the latter end of April, and immediately sowed it with poplar peas.

Expence

Expence and Produce as under: Viz.

EXPENCE.		PRODUCE.	
	£. s. d.		£. s. d.
1777. Rent, taxes, &c.....	4 11 0	1777. Nov. 13. 17½ bufhels, at 5s.	4 7 6
Apr. 29. Once plowing, and drag- ing 3½ acres.....	2 0 0	1½ bufhel talling, at 3s.	0 4 6
6½ bufhels feed, at 4s. 6d.	1 9 3	Straw,.....	1 0 0
Weeding.....	0 6 0		5 12 0
Sept. 13. Cutting.....	0 7 0	Loſs,.....	5 0 5
Harrelling,.....	0 9 0		10 12 5
Hauling, flacking and thatching.....	0 15 0		
Threſhing, 13 days,....	0 15 0	Produce near 5½ bufhels per acre,	
✂ No expence to market, the produce ſold at home	10 12 5		
Amount of produce,	5 12 0		
Loſs on 3½ acres,.....	5 0 5		
Or 1l. 8s. 8d. per acre.			

Moſt eſteemable Husbandry.

OBSERVATIONS.

The above field contained many cammocks, some ant hils, and had been very irregularly laid down, which induced me to plow it.

The *judicious tenant* remarked, that it had always been his and his neighbours' custom, to sow their lands with pease as soon as broken up, for they thought it a great loss to fallow land; and if their grounds were not cropped they could not pay their rents. Had he, or his neighbours, kept an account of the expence and produce of such fallacious œconomical proceedings, he would soon have been convinced, that those savings in husbandry produce poverty; that proper fallowing would have been more beneficial to the land, and attended with much less trouble and loss than if such a detestable method of culture had not been practised; which clearly points out the disadvantages attending the want of good and proper tillages.

OF

OF FALLOW CROPS

AND

FALLOWS.



EXPERIENCE enables me to say, that summer fallows are unnecessary on lands that can be brought into proper tillage for fallow crops. The most attentive observations and experiments have instructed me, that when pastures are intended to be broken up, the beginning of October is the most advantageous season. At that time vegetation begins to decline, consequently the produce of the land is but of little value till the succeeding spring.

If the ground is broken up early in October, and immediately rolled with a heavy stone roller, the sward will be so closed, as speedily to ferment and rot. When the surface begins to crumble, it should be harrowed, that the earth may be loosened and prepared to receive the benefits of the air, rain, and frost.

About

About the middle of December it should be obliquely plowed, as deep as the staple will admit. By this mode, the baulks that were made at the first plowing will be corrected.

The land, being thus left in its rough state, will be exposed to the winter frosts, which will penetrate the hard clods; and, by its expansive force, greatly assist in pulverising the soil.

In the month of February, as soon as the weather permits, it must be well worked with heavy harrows, by which the clods will be greatly, if not totally reduced; and by being thus divided, will receive farther benefit from the influences of the atmosphere.

In the month of March the land should be again rolled, to break the remaining clods; which being pressed into the ground, must
be

be loosened and pulverised by harrowing. In this state the earth should remain for six or seven days, to receive farther benefit from the atmosphere, which will render the soil more friable than if it had been immediately sowed and harrowed.

The latter end of March, or beginning of April, has been the time when my land has been sown broad-cast with poplar peas, harrowed in.

The

The Expence and Produce per Acre, as under :

	£.	s.	d.
Rent, tythe, and taxes, - - -	1	6	0
Breaking up, - - - - -	0	7	6
Two plowings more, at 6s. 6d.	0	13	0
Two rollings,	0	2	0
Four Harrowings,	0	3	0
2½ bushels of seed, at 4s. 6d.	0	11	3
Frightening birds,	0	3	0
Weeding performed by women,	0	1	0
Cutting,	0	1	6
Harvesting,	0	2	0
Hauling, stacking and thatching,	0	3	0
Threshing 25 bushels, at 2½d,	0	5	2½
Carrying to market, - . .	0	4	0
	<u>£4</u>	<u>2</u>	<u>5½</u>

PRODUCE.

	£.	s.	d.
Twenty five bushels, at 4s. 6d.	5	12	6
Straw,	0	10	0
	<u>6</u>	<u>2</u>	<u>6</u>
Deduct expences, . . .	4	2	5½
Clear profit, per acre, .	<u>2</u>	<u>0</u>	<u>0½</u>

By

By this method of cultivation, in lieu of a loss of 1l. 8s. 8d. there arises a clear profit of 2l. 0 $\frac{1}{2}$ d. per acre, which fully proves the great advantage of good tillage, even by the old mode of husbandry.

But the advantage of the new and drill, to the very best old method of cultivation, are great. By the old, the seed is irregularly scattered, and buried at unequal distances and depths. By the drill, the seed is deposited at such a certain required regular distance and depths, in the ground as to meet with moisture. Every seed will soon vegetate, and even in the driest season, will produce an extraordinary crop, from five to twenty bushels per acre, more than by the common mode. The seed, by drilling, is also secured from birds. The intervals admit being hoed and cleaned from weeds, while the ground is preparing for a succeeding crop.

I have

I have before mentioned, that the beginning of October is the best season for breaking up old pasture lands, and as it may be deemed necessary I should add theory to experiment, to illustrate and confirm such an assertion, I must observe, that heat with moisture, are essentially necessary to promote fermentation; which will, in the two months of October and November, rot the sward or turf more than in the four succeeding months, and reduce the soil to a proper state for the second plowing in December; which, with the other operations, will sufficiently pulverise it for the reception of a fallowing crop in the month of March or April.

As the days shorten the cold increases. Cold stops or prevents fermentation.—Hence, when lands are plowed late in November, the sward will not be sufficiently rotted to receive a fallow crop in the succeeding spring. Thus circumstanced, I have

have found it more advantageous to winter and summer fallow land for a crop of wheat, than to plant or sow a fallow crop, when the soil has not been sufficiently pulverised.

In the year 1781, I cleared a field, (which we will distinguish by No. III.) of many superfluous pollard trees. The soil about six inches deep, on a stiff clay, and the very worst ground belonging to my farm. In November, 1782, I broke it up with four horses. As the land contained many roots of trees it was with great difficulty that three quarters of an acre could be plowed in a day. The ground, was afterwards rolled with a heavy stone roller to close the sward, that it might rot the sooner. When the surface began to crumble, I had it well harrowed, that the clods might be the more minutely divided, and exposed to the influences of the atmosphere. In March, 1783, I gave it an oblique

oblique plowing, as deep as the staple would admit. By this mode, the balks, that had been made at the first plowing were corrected.

As I am not fond of fallows, but greatly approve of fallow crops, when the land is properly pulverised; it was my intention to have planted this field with potatoes, peas, or beans. But when plowed the second time, the sward was not sufficiently rotted. In this rough state, it remained near a month; during which time the atmosphere had sufficiently mellowed it; afterwards, I had it well worked with loaded harrows. In the month of June, the remaining clods were broken by a stone roller, and the ground manured with about two hundred and twenty bushels of soaper's ashes per acre, spread on the land out of the waggon. The manure was well incorporated with the soil by harrowing;

ing; and by immediate plowing, the ashes fermented and dissolved, the half-rotted grafs and roots. In the month of September, the land was again well harrowed. On the 7th of October, finished plowing and sowing with cone wheat. At the last plowing the manured stratum was turned on the surface; hence, the corn was nourished by the fertilizing properties of the ashes, which were washed down by rains, and thereby, became intimately blended with the earth. Whereas, had the manure remained buried, the upper stratum of the soil could have received but little benefit.

Expence and produce as under :

		£	s.	d.
1782.				
Nov. 16.	Breaking up, per acre,	0	8	0
	Three plowings more	0	19	6
	at 6s. 6d. - - - -			
	Two rollings, - - - -	0	1	6
	Carried over	1	9	0

	£	s.	d.
Brought over, .	1	9	0
1783. Four harrowings, . . .	0	4	0
July Four waggon loads of soaper's ashes, and car- riage, at 10s. - - -	2	0	0
Oct. 7. Two bushels of seed, at 7s.	0	14	0
Clearing water furrows .	0	2	0
Frightening birds, - .	0	1	0
Weeding, - - - -	0	2	0
Reaping and pooking .	0	8	0
Carrying in, stacking and thatching, . . .	0	2	0
Threshing and winnowing 26 bush. 3 pecks, at 7s.	0	15	7
Carry to market, at $1\frac{1}{2}$ per bushel,	0	3	4
Two years rent, tythe and taxes, - - - -	2	0	0
	8	0	11

PRODUCE.

OF FALLOW CROPS.

131

PRODUCE.

1784. £. s. d.

Oct. Sold 20 bush. for seed, 9 gal- } 7 15 0
lon measure, at 7s. 9d.* }

6½ bushel to bakers, at 7s. 2 7 3

20 dozen of straw, at 1s. - 1 0 0

11 2 3

Expences deducted, - - 8 0 11

Clear profit, per acre, on two years, 3 1 4

Or,

Clear profit, per acre, on one year, 1 10 8

In the month of November, 1783, I
broke up a field, which I will mark Number
IV. The soil of the same quality as
I 2 No.

* The price of wheat is considerably reduced since the
year 1784; therefore, what is at present deficient in
price, may with a certainty, be made more than equivalent
in the increase of produce, by proper culture, drilling,
and hoeing.

No. I. It was immediately rolled after plowing. In December it was well harrowed. In March it was manured with twenty cart loads of dung and soaper's ashes mixed, and immediately plowed in. In April it was harrowed as well as the sward (which was not rotted) would admit of. In May it was plowed, harrowed, and planted with potatoes in plowed furrows, six inches deep, and in rows about twenty inches distant from each other.

Expence and Produce as under: Viz.

1783.	£.	s.	d.
Nov. 26. Breaking up, - - -	0	7	6
Two more plowings, }	0	13	0
6s. 6d. - - -			
Two rollings, - - -	0	1	6
Three harrowings, - - -	0	3	0
Twenty cart-loads of }	3	0	0
compost, at 3s.* }			
Carried over - - -	4	5	0
	Brought		

* The compost was the scrapings of a lime-stone road, soaper's ashes, and dung.

OF FALLOW CROPS.

133

	£	s.	d.
Brought over, - - -	4	5	0
Spreading, - - -	0	1	8
19 bushl. potatoes, at 10d. -	0	15	10
Cutting ditto, - - -	0	2	3
Plowing and planting, -	0	12	0
Twice horse-hoeing, -	0	9	0
Digging 69 sacks, at 4d. -	1	3	0
Wear and tear of baskets, -	0	1	0
One year's rent, taxes, &c. -	1	6	0
Carrying to market 69 } sacks, at 3d. - - }	0	17	3
	9	13	0

PRODUCE.

	£	s.	d.
Sixty-nine sacks, at 3s. . . .	10	7	0
Deduct expences, as above, . .	9	13	0
Clear profit, per acre, - - -	0	14	0

13

In

In order to illustrate the superior advantages accruing from good management and thorough tillage, to improper management, by the erroneous savings of labour and expence; I must now revert to the second produce of my fallow crops, from whence we shall be enabled to draw some conclusion, of the method most beneficial for cultivating a loamy and stiff soil. Therefore we will begin with

THE FIELD,

(No. 1.)

Which, as soon as the peas were carried off, was cultivated as follows, and sowed with clover or hard wheat.

The

*The Expence and Produce per Acre, as under :
viz.*

	£.	s.	d.
Two plowings, - - - -	0	13	0
Two harrowings, - - - -	0	2	0
One rolling, - - - -	0	1	0
Two bushels seed wheat, at 7s. 6d.	0	15	0
Clearing water furrows, - - -	0	2	0
Frightening birds, - - - -	0	1	0
Weeding, - - - -	0	2	0
Reaping and pooking, - - -	0	6	0
Carrying in, stacking and thatching,	0	1	6
Threshing and winnowing $12\frac{1}{2}$ } bushels, at 7d. - - - }	0	7	$3\frac{1}{2}$
Carrying to market, at per bush.	$1\frac{1}{2}$	0	$1\ 6\frac{1}{2}$
Rent, tythe, and taxes, - - -	1	6	0
	£.	3	18 4

PRODUCE:

I 4.

PRODUCE.

	£.	s.	d.
12½ bushels wheat, at 5s. 6d.	-	3	8 9
Thirteen dozen straw, - - -	-	0	13 0
		4	1 9
Deduct expences, - - -	-	3	18 4
Clear profit per acre, - - -	-	0	3 5

One bushel, nine gallon measure, weighed sixty-six pounds ten ounces.

OBSERVATIONS.

The sward, was not half rotted ; had the soil been manured, with lime or soaper's ashes, the grass and roots would have been dissolved, and the land would have been better pulverised. The succeeding year, this field was manured with coal and soaper's ashes, then planted with potatoes, after, with wheat, which produced upwards of thirty-four bushels per acre, each bushel (or nine gallon measure,) weighing seventy-two pounds.

THE

THE FIELD.

(No. 2.)

Was plowed three times, and also sowed with wheat.

Expende and produce as under :

	£.	s.	d.
Three plowings, at 6s. - - -	0	18	0
One rolling, - - - - -	0	0	9
Two harrowings, - - - - -	0	2	0
Two bushels seed wheat, at 6s. 6d.	0	13	0
Clearing water furrows, - - -	0	2	0
Frightening birds,	0	1	0
Weeding,	0	2	0
Reaping and pooking,	0	8	0
Carrying in, stacking & thatching,	0	2	0
Threshing and winnowing 25½ } bushels, at 7d. - - -	0	14	10½
Rent, tythe, and taxes,	1	6	0
	4	9	7½

PRODUCE.

OF FALLOW CROPS.

PRODUCE.

	£.	s.	d.
25½ bushels wheat, at 6s. 6d.	8	5	9
Straw,- - -	1	0	0
	9	5	9
Deduct expences,	4	9	7
Clear profit per acre,	4	16	2

OBSERVATIONS.

When the peas were cut, the land appeared mellow, moist, and of a blacker colour than when sowed. the sward was perfectly rotted, and but few weeds sprung up to interrupt the growth of the wheat. A bushel of which (nine gallon measure,) weighed sixty nine pounds and thirteen ounces.

THE

THE FIELD.

(No. 4.)

After the potatoes were dug out in November, the field was once plowed in high narrow ridges, in which state it remained till March, when it was harrowed, and was so well pulverised by the frost, as to require but one plowing in April; when it was again planted with potatoes, in rows about twenty inches apart. The sets, from six to nine inches distance in the rows,

Expence.

OF FALLOW CROPS.

Expence and produce as under : viz.

	£.	s.	d.
Two plowings,	0	12	0
Two harrowings,	0	2	0
20 bushels potatoes, at 1s.	1	0	0
Cutting the sets,	0	2	3
Plowing and planting,	0	12	0
Three horse hoeings and weeding,	0	13	0
Digging 104 sacks, at 4d.	1	14	8
Baskets,	0	1	0
Cartage and unloading,	0	4	4
Rent, tythe, and taxes,	1	6	0
	6	7	3

PRODUCE.

	£.	s.	d.
104 sacks, neated by fattening hogs }	18	4	0
at 3s. 6d.			
Deduct expences,	6	7	3
Clear profit per acre,	11	16	9

This

This field, was brought into excellent tilth, and although the season was late, I sowed it with cone wheat, (as will be hereafter mentioned,) and reaped a good crop of excellent grain, weighing seventy-two pounds seven ounces and a half per bushel, of nine gallons.

We will now take a retrospective view of the profit and loss on the different fields, No. 1, 2, and 4, the soil of which was as near of the same quality as possible. By comparing the different expence and produce, we may be the better enabled to conclude on the most advantageous method of cultivation.

FIELD.

FIELD.

(No. 1.)

First crop peas.—See page 119.

EXPENCE.

	£.	s.	d.
10l. 12s. 5d. on $3\frac{1}{2}$ acres, }			
is per acre - - }	3	0	8

PRODUCE.

$5\frac{1}{2}$ bushels sold for and straw	1	12	0
Loss on first crop per acre	1	8	8

Second crop wheat.—See page 136.

PRODUCE.

	£.	s.	d.
$12\frac{1}{2}$ bushels sold for and straw	4	1	9
Expences, - - - - -	3	18	4
Clear profit, - - - - -	0	3	5

Which

Which deduct out of 1l. 8s. 8d. loss on the first crop, there then remains a loss of 1l. 5s. 3d. on the two years crop.

This wheat weighed sixty-six pounds ten ounces per bushel, of nine gallons.

F I E L D,

(No. 2.)

First crop peas.—See page 124.

PRODUCE.

	£.	s.	d.
25 bushels sold for and straw -	6	2	6
Expences, - - - - -	4	2	5½
Clear profit on first crop, -	2	0	1½

Second

Second crop of wheat.—See page 138.

PRODUCE.

	£.	s.	d.
25 $\frac{1}{2}$ bushels, and straw,	9	5	9
Expences,	4	9	7
Clear profit on second crop,	4	16	2
Add clear profit on first crop,	2	0	1
Two years clear profit per acre,	6	16	3

Or 3l. 13s. 1 $\frac{1}{2}$ d per acre, per annum.

The wheat weighed sixty-nine pounds and thirteen ounces per bushel, of nine gallon measure.

FIELD.

FIELD,

(No 4.)

First crop, potatoes.—See page 133.

PRODUCE.

	£.	s.	d.
69 sacks, sold for - - - -	10	7	0
Expences, - - - - -	9	13	0
Clear profit on first crop per acre,	0	14	0

Second crop, potatoes.—See page 140.

PRODUCE,

	£.	s.	d.
104 sacks, - - - - -	18	4	0
Expences, - - - - -	6	7	3
Clear profit on second crop per acre,	11	16	9
Add first year's clear profit,	0	14	0
Two years clear profit per acre,	12	10	9

K

Or,

Or, a clear profit of 6l. 5s. 4½d. per acre per annum.

Exclusive, of a larger crop of wheat and better grain being afterwards produced; a bushel of which wheat weighed seventy-two pounds, seven ounces and a half. Nine gallon measure.

F I E L D,

(No. 3.)

First year fallow.—Second wheat.

See page 131.

PRODUCE.

	£.	s.	d.
26¾ bushels, and Straw, . . .	11	2	3
Expences,	8	0	11

Clear profit in two years, per acre	3	1	4
-------------------------------------	---	---	---

Or, 1l. 10s. 8d. per acre per annu 1.

The

The wheat weighed seventy-one pounds per bushel, nine gallon measure.

Thus, we see that land of equal goodness, does, by different management, produce very different profits.

By the field No. 1, there is a loss of 1l. 5s. 3d. in two years, or 12s. 7½d. per acre per annum, with the land being left in bad condition.

By the field No. 2, there is a clear profit of 6l. 16s. 3d. in two years, or 3l. 8s. 1½d. per acre per annum, with the land being left in good condition.

By the field No. 4, there is a clear profit (even after an expence of 3l. 1s. 8d. for manuring,) of 12l. 10s. 9d. in two years, or 6l. 5s. 4½d. per acre per annum, with the land being left in excellent condition; which, afterwards produced a crop of wheat,

K 2

superior

superior in every respect to any of the other fields.

I think, that these experiments and observations evidently confirm, that savings of manure and labour in husbandry, produce poverty; that lands, are too frequently brought into disrepute, from the want of proper management; and that it would be much more advantageous for the landlord, and particularly the tenant, that he should cultivate one hundred acres in a compleat manner, instead of his occupying two hundred acres, which his circumstances will admit of only half plowing, and cultivating, in a slovenly and very imperfect manner.

It appears to me, that Providence never intended tilled land should remain uncropped. Because, weeds will naturally grow on the poorest, as well as better soils; and occupy land, which, with judicious management,

ment, may be advantageously cultivated by meliorating hoed crops; and those vacancies in corn fields, where grain has been sown too thin, or destroyed by birds, are generally filled with weeds, which impoverish the soil more than corn. Hence, fallows are unprofitable and unnecessary.

I have made several experiments on fallow crops, which if inserted, would swell this Treatise far beyond its limits; and as they might tend more to perplex, than to convey useful knowledge, will only observe, that I have experienced, clayey and stiff loams to be improper soils for parsnips, carrots, and turnips; the last, generally had a kind of pungent taste, and grew stringy; and sheep, which had not been accustomed to turnips, would not eat them.

Curious researches into the works of Providence, will investigate the cause why

K 3

some

some crops improve land more than others ;
let this enquiry be our present attempt.

Beans, are a good fallow crop. Their tap roots, will grow from twelve to eighteen inches or more, perpendicularly deep, in a loamy ground. Their numerous fibres or lateral roots, will extend themselves horizontally in a well loosened soil, as long as their roots, and their size, will be in proportion. Consequently, the increase of produce, will also be in proportion to the growth of the roots, and fibres. But, when the stratum of loam is not more than about six or eight inches deep, on a clay, their roots cannot penetrate into, nor procure such store of nourishment, as when planted in a deep loam ; and of course, the crops cannot be so fruitful. I have particularly observed in dry summers, that the greater the distance between, and the thinner the beans grew in the rows, the more they were blighted ; but, when thick, they were not much affected.

affected. To what can we attribute this ? After a few minutes reflection, I believe, we] can impute it to no other, than that the beans are not set at a proper depth in the ground, or the rows are at such a distance from each other, as not to afford sufficient shade, to prevent the sun from exhaling more moisture from the roots, than what is returned by dews, or from want of proper hoeing. Therefore, the plants are deprived of nourishment, and from a want of proper supply of juices, become sickly; or the circulation may be stopped in the leaves, and extreme parts of their stalks, by cold drying winds. Hence, the perspiration is converted into a sweet mucilage, which harbours the black insect called the dolphin, but vulgarly termed the blight. In short, I have experienced potatoes, and poplar peas when drilled, to be more certain, profitable, and superior to any other fallow crops, or fallows, for such soils.

Beans, peas, potatoes, and every other vegetable that produce a succulent leaf, imbibe much nourishment from the atmosphere; their shade prevents the solar rays, exhaling the moisture from their roots, which are very numerous. In a well pulverised soil, the roots of peas will extend horizontally from twelve to eighteen inches, for the closer the peas are planted in the drills, the more they thrive and enrich the land; and instead of robbing each other of their food, they become combined into a formidable body. Therefore by supporting each other, they are better enabled (than when single or few in number,) to force their passage through the earth in search of food. The more numerous are the plants of peas, the thicker is the shade, and the more is the moisture retained in the ground. Hence they cause a putrid fermentation, which fertilizes the soil. Early hoeing, kills weeds, or prevents their growth, so as to be soon stifled by the drilled peas; it also

also loosens the soil, and admits the extension of the roots.

Potatoes, are generally supposed to impoverish land. My crops of wheat after potatoes, have in every experiment, proved much greater, heavier, and finer grain, than after any other vegetable or fallow, equally manured. And, in the field No. 4, (see page 140) I had two successive crops of potatoes, the last of which produced thirty-five sacks, more than the first; with an excellent succeeding crop of wheat; and the ground being left in good order, gives me reason to conceive, that potatoes do not impoverish the land so much, as is generally imagined.

In order, that I might have an opportunity, more conveniently and minutely, to investigate the growth of potatoes, and to attain some further knowledge of the most advantageous

tageous method of their cultivation, I made the following Experiment, viz,

On the 10th day of May 1786, I had six Scotch potatoes, that weighed two pounds and two ounces, cut into thirty-three sets, with two eyes each, which were planted in a stiff deep soil, with a small quantity of rotten dung scattered under and over the sets, which were planted about six inches deep, at the following distance in the rows, divided by pegs :

No. 1.—11 cuts at 6 inches distance.

2.—11 ditto 9 ditto.

3.—11 ditto 12 ditto.

They were hoed twice.

On the 10th of October the earth was carefully drawn from off the plants, which were extended across the rows, each measuring alike one foot.

PRODUCE.

PRODUCE.

No. Potatoes.	Weighed.	Occupied.
	lb. oz.	
1—124	28 10	6 feet in length.
2—130	32 2	9 ditto.
3—145	31 2	13 ditto.
Total weight	<u>91 14</u>	

Although the ground, was dug about a foot deep, the plants and fibres, did not grow perpendicularly, but horizontally across the rows, so far and so high, as the loosened or hoed earth extended. Hence, it evidently appears, that the soil, being continually moved by the growth of the potatoes and hoeing, its particles are so minutely divided, as to permit the free admission for the atmospherical influences, which fertilize the land, and render the succeeding crops more productive, than after any other fallow crop; for, the soil being more pulverised,

pulverised, the roots of the succeeding plants, can the easier range in search of food; which, in proportion to the nourishment they acquire, fills the grain, and makes it weigh heavier, than when its roots are confined; and is the most certain proof, that good tillage is one of the greatest secrets in Agriculture.

The next fallow crop that ranks as second on my list, is peas; their effects as a meliorating crop, has been already explained. As they are generally cut early, time permits to give the better tillage for wheat. And, from the experiments which I have made, do believe, that on good loamy or stiff soils, wheat, drilled and hoed, may alternately succeed either potatoes, peas, beans, buck wheat, or any other meliorating hoed crop, for any number of years; provided the stubble is immediately, or soon after harvest, plowed as deep as the stratum will admit, into one bout ridges,
by

by which, the soil will be kept dry and exposed to the frosts, that will pulverise it. This mode, with the addition of proper manure once in about four years, will keep the land in excellent order and improve it. I have experienced, that one plowing in autumn is of more benefit, than two plowings in the spring. Because, the plowing in autumn, particularly into high, one, or two bout ridges, leaves the earth so raised and exposed, as to become enabled, to admit the atmospherical influences. The grubbs and worms therein contained, are killed by the frost and cold, exclusive of the earth being thoroughly pulverised; which on a few moments reflection, by the scientific farmer, must evidently appear to be, superior to two plowings.

OF

OF THE
DRILL HUSBANDRY.

DRILLING, is the sowing, planting, or depositing, in regular rows, any kind of grain, seeds, or pulse, of any required quantity, at any required depth in the earth, and distance between the rows.

The superior advantages arising from the drill, over the broad-cast or common mode of husbandry, are great and numerous. By the common mode of sowing, the general quantity of wheat used, is from two to two and half bushels per acre.

Of

Of barley, about four bushels per acre ; and other seeds in proportion. The seed, is thereby, irregularly scattered over the ground, and either dragged or plowed in ; when dragged, great quantities of seed remain uncovered ; part, lies so near the surface of the earth, which is washed off by the first heavy storm of rain, and the seed is exposed to the ravages of the birds, or lies so shallow as to be hove out of the ground, by severe frosts. Hence, near one half of the seed so sown, is entirely lost, and the remaining part is deposited at such unequal depths, as to prevent a regular ripening. When plowed in, great part is buried so deep, as to be rotted by the wetness of the soil, or produce small thin ears, and frequently but a scanty crop. Grain, sown broad cast, grows so irregular, as to exclude the free admission of the air, and cannot be hoed.

When

When wheat is drilled in rows, at the distance of eleven or twelve inches, about three pecks ; if at nine inches, about one bushel ; if at six or seven inches, about a bushel and half a peck of seed, is sufficient for an acre. About one bushel and a half of barley at six inches, or less in proportion, when sown at nine or twelve inches, is fully sufficient for a statute acre of rich land, properly cultivated. Thus, more than one-half of the seed of wheat, and five-eighths of the seed of barley, is saved, exclusive of the great increase of crops.

By drilling, the grain is deposited at an equal depth, and regular distance in the ground ; it is at the same time covered, and secured from the birds ; every grain that is good will vegetate, and produce an even crop, far superior in quantity and quality, to any sown broad cast.

When grain is drilled, from six inches to any greater distance in the rows, it will enjoy

it will enjoy the free admission of air, and the intervals can be hoed at a less expence than weeded; the other advantages of hoeing, will be hereafter illustrated. When grain is drilled, it is not so subject to be beat down by rains and high winds. Its stalks are so much stronger, than the stalks of broad cast grain, as to be better enabled to support their larger heads against tempestuous weather; and when their stalks bend under their heavy loads, each row supports the other in such a manner, as soon to rise again, without being injured. Drilled, and hoed crops, as being free from weeds, may be reaped lower, and with less difficulty than broad cast crops, which are often laid with storms, and so entangled, as to be cut at a greater expence and loss of grain, as also loss of straw, where weeds grow high.

The superior increase of drilled and well hoed crops, to broad cast, are generally

L

from

from six to twenty, or thirty bushels per acre, in proportion to the natural richness and proper culture of the soil; and the superior weight of drilled grain is about two pounds per bushel.

Other advantages accrue from drilling in dry seasons. The seed, by being deposited from two to not exceeding three inches in the ground, will meet with moisture, soon vegetate, and produce even fruitful crops; while the broad cast lies so near the surface, or at unequal depths, as to be parched by the heat of the sun, or buried too deep to afford but very scanty, unequal ripened crops. Drilling also ensures a certain crop in all seasons.

Every Agriculturist, and all others, have an undoubted right to enjoy their own opinions; but every unprejudiced Agriculturist must, after a few minutes reflection, best judge which is most advantageous, to raise
a crop

a crop of fifty bushels of wheat at five shillings, or thirty bushels at six shillings per bushel, exclusive of one bushel of seed saved per acre.

Simplicity, and strength of machines, constructed on the most accurate mathematical principles, are the best calculated for the use of common plowmen. Hence, are most worthy the farmer's attention, who will not hesitate to pay from twenty to thirty pounds for a waggon that may be worked a few years. He cannot do without it.

A strong machine, at an expence of fifteen pounds, will with care, last thirty years; but before we proceed further, it is necessary to enquire how a farmer can be benefited by paying fifteen pounds for such a piece of mechanism? And in order to attain proper ideas of some return for his fifteen pounds, we will make the following

L 2

candid

candid calculation of a farm, whereon is cultivated annually, one hundred acres of wheat, and one hundred acres of barley: viz.

From two to two bushels and a half, nine gallon measure, of seed wheat, being the quantity generally sown broad cast, one bushel is sufficient for drilling per acre. Four bushels, nine gallon measure, of barley, being the quantity generally sowed broad cast, one and a half bushel is sufficient for drilling per acre. Therefore, there is a saving, by drilling of

	£	s.	d.
100 bushels of wheat, at 5s.	25	0	0
250 bushels of barley, at 3s.	37	10	0
The least extra crop 6 bushels per acre.			
600 bushels of wheat, at 5s.	150	0	0
600 bushels of barley, at 3s.	90	0	0
	£. 302	10	0
	Exclusive		

Exclusive of an extra increase of straw, and the land being kept in better condition by hoeing.

However marvelous the above calculation may appear, I will with certainty assert it as a real fact, that the above extra produce from drilling, even on a midling soil, properly prepared as for common sowing, is considerably under rated.

These assertions are not ideal, but are founded on facts and experiments.

We will further examine, which is most advantageous to the judicious farmer, a waggon that may gain him thirty pounds (being its full value) in one year, or a strong machine without the least complex work, that will with care last him upwards of thirty years, and will gain him more, nay, much more than three hundred pounds in one year.

L 3

I will

I will now make my calculation on a smaller scale. A farmer, who has under tillage fifteen acres of wheat, and fifteen acres of barley, may suppose that the advantages resulting from such a machine may not be adequate to the expence:— Without calculations no proper ideas can be formed, therefore we will proceed.

	£.	s.	d.
15 bushels of seed wheat sowed, at 5s.	3	15	0
37½ bushels of seed barley sowed, at 3s.	5	12	6
90 bushels of wheat, being an extra produce,	22	10	0
90 bushels of barley, ditto,			
	£.	45	7 6

Exclusive of straw, &c.

How far a farmer may think it an object to procure a machine that will cost him

him fifteen pounds, which will with care last him upwards of thirty years, and gain him forty five pounds the first year, must be left to his consideration.—But I must beg leave to make one observation, that the lenient laws of this happy isle do not compel men to get or save, any more than oblige them to spend money, contrary to their own free will and inclinations. This makes me recollect a circumstance that occurred last September, which I cannot pass over unnoticed : A farmer, whom till then I had always esteemed as a sensible man, held some conversation with me on the subject of drilling ; he had seen my crops, which he acknowledged to be far superior to my neighbours ; I informed him of all its superior advantages over the common mode of husbandry ; that the kingdom would be immensely benefited by the saving of such astonishing quantities of seed ; by the amazing increase of crops and straw, which might be converted into ma-

nure, for enriching the land ; by enabling us to supply our colonies with flour on reasonable terms ; by reducing the price of bread to the poor ; that it would be much more advantageous for the farmer to raise a produce of even thirty bushels, at five shillings, which is seven pound ten shillings, than to reap a crop of only twenty bushels per acre, at six shillings, which is six pounds ; and that the tenant, would thereby be better enabled to pay his rent. That I was fully convinced, when a man saw his neighbours fields produce a much more fruitful crop than his own, however prejudiced he might be against new modes, he would in a short time pursue the same mode ; and that the new system, with the drill husbandry, must very speedily become general, as being of the greatest national utility. In short, although he appeared to be convinced, yet the purport of his answer was, that if he varied from the old mode, his landlord would ultimately reap the advantages,

advantages, his rent would be raised, and that he was well contented with his ancient system! Happy it is that such an opinion does not always prevail.

The numerous experiments which I have made on a small scale, and which I have this season extended on a larger one, enables me with certainty to say, that grain drilled about six or seven inches distance between the rows, produce the largest crops. Particular investigations and observations teach me, that in close rows, the roots and fibres get so combined, and acquire such strength, as to penetrate better into, keep the soil more open, and by the assistance they afford each other, are enabled to thrive better and ripen earlier, than in wider intervals. The rows of grain at six or seven inches distance, smother the weeds, cause a putrid fermentation in the ground, prevent the moisture being exhaled by the sun, and the fibres being scorched by the summer's heat. At
harvest,

harvest, the ground is moister, and appears much blacker, than in wider intervals.

When grain is sown in rows, with intervals of twelve or nine inches, the weeds grow much more luxuriant, and the sun in summer has more power and greater access to the roots of plants. Hence, six or seven inches I deem to be the best distance between the rows of corn. Experiments of this kind may be easily made without any extra expence, and the inquisitive Agriculturist will be soon convinced of the above distance being the most advantageous.

When carrots are drilled at the distance of twelve inches between the rows, one man can hoe two acres a day, and the plants are thinned at less than half the expence of those sowed broad cast.

Turnips, are generally sowed in the driest season of the year; by drilling at one, or
one

one inch and a half deep, the seed is deposited in moisture, and will produce a more certain crop; they should be drilled at a distance of fifteen inches between the rows, when the intervals should be hoed with a running or breast hoe of twelve inches broad; they also are more expeditiously thinned in the rows, and at one half of the expence of those sowed broad cast.

Thus, by saving expence and time by hoeing, the labourer may be employed in clearing the sides of banks from weeds, thorns, &c. or any other necessary work.

Dr.

Dr. HUNTER's
OBSERVATIONS

ON

DRILL SOWING.

“ THE anatomical investigation of the
“ roots of wheat and other grain,
“ has convinced me of the necessity of
“ placing all kinds of seeds at a certain
“ depth in the earth, in order to their
“ producing vigorous and healthful plants.
“ For this wise purpose a variety of drill
“ plows have been invented and recom-
“ mended; but, from the expence at-
“ tending the purchase, and the extreme
“ complication of their structure, there is
“ not

“ not an instrument of that kind, as yet
“ discovered, that is likely to be brought
“ into general use.*

“ When I speak of the drill plow, I do
“ not connect the idea of its working with
“ the horse hoe. I here consider it only
“ as an instrument for sowing land in equi-
distant rows, which by opening a furrow,
shedding the seed and covering it, leave the
land stocked with plants in the manner of
broad cast sowing.

“ Grain, sown by the hand, and covered
“ by the harrows, is placed at unequal
“ depths: the seeds consequently sprout at
“ different times, and produce an unequal
“ crop. When barley is sown late, and
“ a drought succeeds, the grain that was
“ buried

* This obstacle is now entirely removed, as evidently
appears from the most strong and simple structure of the
machine, described in this publication, and which is adapted
to the meanest capacity.

“ buried in the moisture of the earth, soon
“ appears, while such as was left near the
“ surface, lies baking in the heat of the sun,
“ and does not vegetate till plentiful rains
“ have moistened the soil. Hence, an in-
“ equality of the crop, an accident to which
“ barley is particularly liable. The same
“ observations, but in a more striking man-
“ ner, may be made upon the sowing of
“ turnips. It frequently happens, that the
“ husbandman is obliged to sow his seed in
“ very dry weather, in hopes that rain will
“ soon follow, and either rolls or covers,
“ it with a bush-harrow. We will sup-
“ pose that, contrary to his expectations,
“ the dry weather continues, the seed, be-
“ ing near the surface, cannot sprout with-
“ out rain. The husbandman is mortified
“ at his disappointment, but is soon satis-
“ fied, and made easy by a perfect acqui-
“ escence in what he thinks is the will
“ of Providence. The scourge that he
“ feels, must not be placed to the dispen-
“ sation of Providence, but has its source
in

“ in the ignorance of the man himself.
“ Had he judiciously buried the seed in the
“ moisture of the soil, with the drill plow,
“ or harrowed it well with the common
“ harrow, his seed would have vegetated
“ in due season. and bountifully repaid
“ him for his toil.

“ The man, that expects the seed to ve-
“ getate by heat alone, little knows the im-
“ mutability of nature's laws. Heat and
“ moisture, when combined, unfold the
“ particles of matter closely connected in
“ the seed, and by a kind of fermentation,
“ bring the living principle into action.

“ The husbandman, that knows and stu-
“ dies these divine truths, will often dis-
“ cover his want of success in his want of
“ knowledge. Such a man, will never re-
“ pine at Providence, but, amidst the ad-
“ verse calamities of seasons, will at all
“ times

“ times look up to the Deity, with comfort
“ and satisfaction.

“ Reflections, upon this divine subject
“ cannot be brought down to the level of
“ vulgar minds. Modes more familiar will
“ in general, be better understood, and more
“ agreeably received. All mankind are not
“ philosophers.

“ In the year 1769, I prepared a fifteen
“ acre close for turnips. The land was in
“ fine condition as to lightness, and had
“ been well manured. On the 24th of
“ June I sowed fourteen acres of this field,
“ broad cast, and harrowed in the seed
“ with a bush harrow; the remaining
“ acre I sowed on the same day with the
“ drill-plow, allowing fourteen inches be-
“ tween each row, and set the shares near
“ two inches deep. At the time of sow-
“ ing, the land was extremely dry, which
“ induced

“ induced me to make the experiment
“ with the drill plow, knowing that I
“ could place the seed into the moisture of
“ the soil. From the time of sowing to
“ the 5th day of July, we had a continual
“ drought, so that the broad-cast seed did
“ not make its appearance till about the
“ 8th of that month, at which time the
“ drill turnips were in rough leaf, having
“ appeared upon the surface the sixth day
“ after sowing.

“ In the driest seasons, at the depth of
“ two inches, or less, we are sure of find-
“ ing a sufficiency of moisture to make the
“ seed germinate. When that is once ac-
“ complished, a small degree of moisture
“ will carry on the work of vegetation,
“ and bring the tender plant forward to
“ the surface.

“ When extreme dry weather obliges
“ the broad cast farmer to sow late, he has

M

“ no

“ no opportunity of sowing a second time,
“ if the fly should get in the field. The
“ drill secures him, in some degree, against
“ that misfortune, by giving him a full
“ command over the seasons.

“ I do not confine the excellence of the
“ drill plow to turnip seed. It is an useful
“ instrument for sowing all kinds of grain.
“ By burying the seed at an equal depth, it
“ secures an equal crop in all circumstances
“ of the weather. But this is not the only
“ consideration to the cultivator; it saves
“ near one half of the seed, which is an
“ object of importance to the tillage
“ farmer.*

“ In order to be clearly understood upon
“ this subject, I beg leave to observe, that
I do

* More than one half of seed wheat, in many instances,
and five parts out of eight of seed barley is saved by the
use of my machine, exclusive of the great increase of crops.

" I do not here recommend the drill-plow
 " as a good instrument for sowing turnip-
 " seed, unless when the weather is so dry
 " and sultry as to give the farmer reason to
 " apprehend danger from the late sprout-
 " ing of the seed. When the weather
 " favours germination, the broad-cast me-
 " thod, by being most expeditious, and
 " less expensive, is much more eligible.*

" When the farmer chooses to introduce
 " the horse-hoe,† the drill must then be
 M 2 " recommended

* From the learned Doctor's observations on the extreme
 complication or the structure of the drill-plows then used, it
 must be concluded, they were not capable of executing so
 expeditiously as mine, which, with a man, boy, and two
 horses (even in the strongest or stiffest soil) will completely
 drill from eight to ten acres a day, and at the same time
 cover the seed.

† A breast or running-hand hoe is now made of any size,
 as to suit the distance between the rows of corn, it cuts the
 weeds at the same time, and moulds up the rows of grain.
 One man can hoe from an acre to an acre and a half of light
 land, and from half an acre to an acre of stiff land, in a day.

“ recommended in all seasons, on account
“ of its distributing the seed in rows.
“ The shares must be placed deeper or
“ shallower, according to the dryness or
“ wetness of the season.

“ Was I to give my opinion upon the
“ best method of raising turnips, I should
“ not hesitate one moment to declare in
“ favour of the drill and horse-hoe, with
“ intervals of three feet; but an enlarge-
“ ment of this subject does not come within
“ the idea of the present essay, which only
“ respects the drill-culture, in equi-distant
“ rows, independent of the horse-hoe.

“ Having sufficiently enlarged upon the
“ necessity of lodging the turnip seed within
“ the earth, during an extreme drought,
“ I shall now proceed to an experiment
“ made upon barley, with a view to re-
“ commend the sowing of that grain, as
“ well

“ well as all others, by the drill-plow, in
“ preference to the customary method.

“ In the spring of the year 1769, I
“ sowed an acre of barley, in equi-distant
“ rows, with the drill plow, in a field
“ which was sown with the same grain, and
“ upon the same day, broad cast. The
“ broad cast took three bushels per acre;
“ the drill required only six pecks. This
“ circumstance is worthy observation. The
“ drills were eight inches asunder, and the
“ seed was lodged about two inches with-
“ in the soil. The drill acre was finished
“ within the hour, and the most distinguish-
“ ing eye could not discover a single grain
“ upon the surface.

“ In the course of growing, the drill
“ barley seemed greener, and bore a broader
“ leaf than the broad cast. When the ears
“ were formed throughout the field, the
“ ear of the drill barley was plainly distin-

“ guished to be near half an inch longer
“ than the broad cast, and the grains
“ seemed fuller and better fed. This ap-
“ pearance occasioned a general surprise, and
“ I confess I was at first at a loss how to
“ account for this apparent difference.

“ Reflecting upon some experiments that
“ I had made upon the roots of wheat, I
“ was induced to dig up some roots of the
“ drill and broad cast barley, and was most
“ agreeably surprised to find the cause of
“ the difference to be in the roots. The
“ pipe of communication between the se-
“ minal and coronal roots of the drill bar-
“ ley, was considerably longer than the
“ broad cast. And upon that appearance I
“ was convinced that the length of the ear,
“ and the strength of the straw, principally
“ depended.

“ I shall not here repeat what I have
“ formerly advanced upon the shape of the
“ roots

“ roots of wheat. The curious reader will
“ find that subject clearly and satisfactorily
“ explained in the first volume of these
“ essays. Without an attention to this
“ simple mechanism, it is impossible for
“ the cultivator to have any adequate idea
“ of the vegetation of corn. It is matter
“ of surprise that such a self evident truth
“ should have hitherto escaped the obser-
“ vation of naturalists. Upon it the doctrine
“ of top-dressings depends. Every person
“ knows their use, but few can explain
“ the manner of their operation. But to
“ return.

“ The product of two hundred square
“ yards of the broad cast and drill barley
“ were carefully housed, and afterwards
“ thrashed out. The drill exceeded the
“ other nearly one fifth in measure, and
“ being a bolder and better grain, weighed
“ heavier, at the rate of two pounds in the
“ bushel.

“ From the experience that I have had
“ of the drill sowing, I can recommend it
“ as a most rational and judicious practice.
“ But as it has many difficulties to over-
“ come, I apprehend it never will be
“ brought into general use. A proper in-
“ strument is wanting that would come
“ cheap to the farmer, and have the re-
“ quisites of strength and simplicity to re-
“ commend it. The present instruments
“ cannot, by any means, be put into the
“ hands of common servants. Should we
“ ever be so happy to see this objection
“ removed, it is probable that all kinds of
“ grain will be cultivated in drills.* Corn
“ growing in that manner has a freer en-
“ joyment of air, and the farmer has an
“ opportunity

* I must again beg leave to repeat, that my Machine has the requisites of strength, that nothing but the greatest violence can injure it; and its simplicity is such, as to be in a few minutes perfectly understood by any person of the lowest capacity,

“ opportunity of hand hoeing and weed-
“ ing without injury to the growing crop.
“ This is an object of the utmost conse-
“ quence in the cultivation of beans and
“ winter corn.

“ Wheat placed into the earth by the
“ drill plow, is not liable to be turned out
“ after frosts: The seminal root serves the
“ purposes of an anchor. This is a con-
“ sideration of great consequence to the
“ farmer.

“ Much more might be advanced upon
“ this curious and interesting part of Agri-
“ culture. But I flatter myself that those
“ loose thoughts will be the means of
“ awakening the attention of others, who
“ have more leisure and greater abilities
“ than I have.

“ After what I have advanced it will be
“ needless to observe, that in this essay I
“ only

“ only mean to recommend the drill plow
“ for sowing the land in equi-distant rows,
“ instead of distributing the seed by hand
“ in the manner called broad cast. The
“ drill, when connected with the horse-
“ hoe, constitutes quite a different system,
“ which has great merit when judiciously
“ conducted.

“ It will not be improper to observe in
“ this place, that most gentlemen who
“ have favoured the public with compara-
“ tive experiments, between the drill in
“ equi-distant rows, and the broad cast,
“ or old method, have chosen an improper
“ distance between the rows, and by that
“ means rendered their comparative trials
“ inconclusive. A foot is the distance
“ generally taken, which, beyond doubt,
“ will not only encourage the growth of
“ weeds, but also prove a considerable loss
“ of land. The distance should never ex-
“ ceed eight or nine inches, and then the
“ comparative

“ comparative trial would be conclusive, as
“ both methods are supposed to be con-
“ ducted in the most perfect and advan-
“ tageous manner.”

Dr. Hunter's Georgical Essays. V. III. P. 28.

EXPERIMENTS

EXPERIMENTS
ON
DRILLING GRAIN.

BY
M. LULLIN DE CHATEAU-VIEUX,
*First Syndic of the City and Republic of GENEVA,
in the year 1752.*



ON FIELDS
SOWN IN EQUI-DISTANT ROWS
WITH THE
DRILL PLOW.



“ I HAVE sowed fields cultivated in every
“ respect in the common way, except
“ in the manner of distributing the seed.
“ which

“ which was done with the drill plow.
“ The whole field was covered with
“ rows of wheat, distant from each other
“ seven inches and an half.

“ The advantages I proposed to myself
“ by sowing in this manner, were, first,
“ the saving of seed and preventing the
“ earth from being overstocked with
“ plants: secondly, burying the seed at a
“ proper depth: thirdly, having the plants
“ at equal distances: and lastly, the little
“ stirring of the ground and breaking of
“ the clods, which the drill plow effects
“ at the same time that it sows. These
“ things seemed to me more likely to be
“ attended with success, than the common
“ way of sowing.

“ The plants of this wheat were very
“ fine: their deep green colour shewed
“ their strength: the largeness of their
“ blades, and the number of their stalks,
“ shewed

“ shewed likewise that they found greater
“ plenty of nourishment than wheat in the
“ common way. The plants had, in
“ general, four, six, eight, ten, or more
“ stalks ; so that these fields, which, ’till
“ the month of April, seemed scarcely to
“ have been sown, changed then so as
“ hardly to be known again, by the number
“ of stalks which shot forth at that time.
“ The wheat was taller than that in the old
“ way, and the ears larger and better filled
“ with grain.

“ An account of the produce will shew
“ what may be expected from this manner
“ of sowing.

“ Account of the produce of the same
“ field sowed part in the old way, and
“ part with the drill plow, the fourteenth,
“ fifteenth, and sixteenth of September,
“ 1751.

“ The

“ The whole of this field used commonly to be sowed with twenty measures of wheat, each measure containing one hundred and six pounds of eighteen ounces. Three measures, or three hundred and eighteen pounds of wheat, were sown in the usual way in the richest part of the field. The remaining part was sowed with the drill plow, with only two hundred and sixty five pounds of wheat, which in the common way would have required one thousand eight hundred and two pounds.

“ The soil was middling, neither too strong nor too light, and pretty stony. The land was poor, because it had not been dunged; which indeed it seldom was, the owner not having more than was necessary for his vines.

“ Produce

" Produce of the new Husbandry.

	lbs.	lbs.
" The 263 lbs. of wheat }		
" produced - - }		5450
" To be deducted,		
" For small and bad grain }	218	
" sifted out 4 per ct. }		
" For the seed, - - - }	265	
		<u>483</u>
" Neat produce,		4967
" If the other part of the }		
" field, which was }		
" sowed with the 3 }		
" measures in the }	960	
" old way, had been }		
" sown with the drill }		
" plow, it would }		
" have yielded - }		
" To be deducted,		
" Loss by sifting 4 }	38	
" per cent. }		
" For the seed, - }	46	
		<u>84</u>
" Neat produce to be added —		876
" to the above,		<u> </u>
" Neat produce of the whole,		5843

“ Produce of the old Husbandry.

“ That part of the field which was sowed
 “ with the three measures of one hundred
 “ and six pounds each, produced thrice
 “ that quantity of seed, mixed with bad
 “ grain. The same measure of this grain,
 “ weighed but one hundred and three
 “ pounds. This field yields no more even
 “ in the best years. If the whole of it
 “ had been sowed in the old way, it would
 “ have produced, lbs. 6180

“ To be deducted,

“ Loss by sifting, 15 per	} lbs.	
“ cent. it has often		
“ been 25lb. and 30		927
“ per cent. , - -		

“ For the seed, - - - 2120

3047

“ Neat produce, - - - - - 3133

“ Balance in favor of the new method, 2710

5843

Duhamel's Husbandry, page 157.

N

It

It is to be remarked, that from all M. DE CHATEAU-VIEUX's reports, that the lands about Geneva, appear to be extremely poor, consequently very badly adapted for wheat. Other numerous experiments were tried by this ingenious Agriculturist, all which clearly prove the great and superior advantages of the drill husbandry, over the common method of broad cast sowing.

And, as I wish to make this publication as short as the subject can possibly admit of, will only beg leave to quote M. DE CHATEAU-VIEUX's recapitulation of one part of his experiments, referring those who may be desirous of further information to consult DUHAMEL's Husbandry, where many others, equally interesting, may be seen.

“ RECAPITULATION.

" RECAPITULATION.

" We have seen a very considerable
" experiment repeated three years running,
" and always attended with great success.
" I shall now sum up the essential and de-
" cative facts, which are so many unexcep-
" tionable witnesses, who depose, that it
" is much more profitable to sow lands with
" the drill plow, than to sow them in the
" common way.

" To this end, I resume the neat products
" of the crops.

“ New Husbandry.

“ Neat produce of three Farms.)

	lbs.
“ In 1745, - - - - -	93418
“ 1755, - - - - -	120702
“ 1756, - - - - -	111738
“ Total neat produce of 3 years,	325858

“ Old Husbandry.

	lbs.
“ 1754, - - - - -	62200
“ 1755, - - - - -	50516
“ 1756, - - - - -	55200
“ Total neat produce of 3 years,	167916

“ The difference in favor of	} 157942
“ the new husbandry, in 3	
“ years, amounts to - -	

“ This is an object of great importance,
 “ not only to the public, whose welfare
 “ it

“ it highly concerns, but to every owner
“ of land. How strongly does it shew the
“ vast advantage of the drill husbandry !
“ We here see one hundred and fifty arpents
“ of land produce one hundred and fifty-
“ seven thousand nine hundred and forty-
“ two pounds of wheat more than they
“ would have done without this favourable
“ culture.

“ Any one may easily reckon the value
“ of such a quantity of wheat, supposing
“ it to be of the very best sort, as in fact it
“ was.

“ Reckoning the English bushel at sixty-
“ two pounds, these one hundred and
“ fifty-seven thousand nine hundred and
“ forty-two pounds will exceed three hundred
“ and twenty quarters of wheat. Being
“ the superior produce of the new to
“ the old husbandry.

Duhamel's Husbandry, page 278.

EXPERIMENTS

EXPERIMENTS
ON
DRILLING BARLEY.

COMPARATIVE VIEW OF TWO CROPS
OF BARLEY;

*One drilled, and the other sown broad-cast, in the
same field.*

BY

Sir JOHN ANSTRUTHER, Bart.

" GENTLEMEN.

" I Herewith send you an account of an
" experiment, made to ascertain the
" produce of drilled barley, compared
" with broad cast; they were sown on
" the

“ the same field, and at the same time,
“ and there was no apparent difference in
“ the soil.

“ You may depend on this account
“ being perfectly just.

“ The drills were eighteen inches wide,
“ and the grain was dropped by hand, the
“ expence of which was three shillings and
“ three-pence per acre.

“ The seed drilled was one bushel and
“ three gallons per acre. The produce
“ was fifty-six bushels and three gallons
“ per acre.

“ On the broad-cast part the seed sown
“ was three bushels and five gallons per
“ acre. The produce only thirty-six bushels
“ and five gallons per acre.

“ Extra produce of the drilled crop about
“ twenty bushels per acre, besides near two
“ bushels of seed saved.

“ London,
“ February 10, 1786.”

Bath Soc. Pap. Vol. III. p. 390.

EXPERIMENTS.

EXPERIMENTS ON DRILLING GRAIN.

WILLIAM WHITMORE, of Dud-
maſton, near Bridgnorth, Shropſhire,
Eſq. in his letter, dated December 29,
1784, to Owen Saluſbury Brereton, Eſq.
V. P. F. R. and A. S. Soho-Square, did
not heſitate to decide greatly in favour of
the drill ſyſtem, when properly under-
ſtood; and would venture to affirm, that
ſhould ever that method be generally pur-
ſued, it would ſoon prove a great national
advantage.

That the ſoil on which he began to uſe
the drill-plow, was a good hazle loom, a
ſpade's

spade's depth, having a sandy, gravelly bottom ; that in the year 1783, it produced a large crop of turnips, after proper preparation of fallowing, mucking, &c. were eat off the premises by sheep, the succeeding spring ; when it was twice plowed, and in the middle of April, six statute acres of barley, and two of spring wheat were planted in equi-distant drills of eighteen inches, taking something less than a bushel of seed to each acre ; that as soon as the grain was completely up, and weeds appeared, had the crop well hoed, and such hoeing again repeated on the second appearance of weeds, which made the crop grow so vigorous, that the intervals between the drills were hardly discernable. That the excessive heavy rains which fell last summer injured many strong crops ; that the above crops, though frequently lodged, rose again with great vigour ; that his neighbours, who had reprobated his method of proceeding and ridiculed the folly of sowing so small a quantity

quantity of seed, found their prediction of so small a crop, prove the reverse, for the return was upwards of sixty bushels, Winchester measure, of barley, and thirty bushels of spring wheat to the acre. That the most favourable and rich spots in these environs would not produce, by any broadcast sowing, above fifty bushels of barley; and that this system, exclusive of a large crop, has, in respect of saving of seed, evidently the advantage, not only in regard to general benefit, but even individually so, in point of œconomy, the two hoeings being well performed for three shillings per acre. In respect to wheat, twenty-five bushels is reckoned a fair crop in the best districts; and that more than thirty bushels of winter planted corn may be expected by this process; and that forty and fifty bushels had been produced, when planted in equi-distant rows of one foot.

Transf. of Lond. Soc. for Encourag. of Arts, &c.

Vol. IV. p. 10.

ON

ON
DRILLING GRAIN.



BY

Mr. MILLER.

MR. MILLER, was fully convinced of the superior advantages of drilling grain, to the common method of broad cast sowing. He says, “ I have seen experiments made by sowing barley in rows across divers parts of the same field, and the rows a foot distance. The intermediate spaces of the same field, were, at the same time, thrown broad cast in the usual way. The success was this : the roots of the drilled, tillered out from ten or twelve to upwards

“ wards of thirty stalks on each root; the
“ stalks were stronger, the ears longer,
“ and the grains larger than any of those
“ sown in the common way; and when
“ those parts of the field, where the corn
“ sown in the usual way has been lodged,
“ those parts sown thin have supported
“ their upright position against wind and
“ rain. Though the rows have been made
“ not only length ways, but cross the
“ lands in several positions, so that there
“ could be no alteration in regard to the
“ goodness of the land, or the situation of
“ the corn. Therefore, where such experiments
“ have been frequently made, and
“ always attended with equal success, there
“ can be no room to doubt which of the
“ two methods is more eligible, since, if
“ the crops were only supposed to be
“ equal in both, the saving more than half
“ the corn sown is a very great advantage,
“ and deserves a national consideration, as
“ such a saving, in scarce times, might be
“ a very great benefit to the public.

“ I know

“ I know the farmers in general, are very
“ apt to complain, if their corn does not
“ come up so thick, as to cover the ground
“ green in a short time, like grass fields.
“ But I have often observed, that when,
“ from the badness of the season, it has
“ come up thin, or by accident has been
“ in part killed, their corn has been stronger,
“ the ears longer, and the grain plumper;
“ so that the produce has been much
“ greater. than in those years when it has
“ come up thick; for the natural growth
“ of corn is to send out many stalks from
“ the root; therefore it is entirely owing
“ to the roots standing too near each
“ other, when the stalks are drawn up
“ tall and weak. I have had eighty-
“ six stalks upon one root of barley, which
“ were strong, produced longer ears, and
“ the grain was better filled than any
“ I ever saw grow in the common method
“ of husbandry; and the land upon which
“ this grew was not very rich. But
“ I have

“ have frequently observed, on the sides
“ of hot-beds, in the kitchen-gardens,
“ where barley straw has been used for
“ covering the beds, that some of the
“ grains left in the ears have dropped out,
“ and grown, the roots have produced
“ from thirty to sixty stalks each, and those
“ have been three or four times larger than
“ the stalks ever arrive at in the common
“ way.

“ The noblemen and gentlemen, in
“ France, are very busy in setting examples
“ of this husbandry, in most of their
“ provinces, being convinced of its great
“ utility by many trials; and it were to
“ be wished the same was done in England.”

OF

or

HOEING.

HOEING, is the breaking or dividing of the soil, by plows or other instruments, while the corn or plants are growing thereon.

When stiff land is not hoed, it will soon coalesce, and continue consolidating, till it acquires the same solidity, that it had before it was cultivated; of course, the dews and rains cannot freely penetrate to the roots of plants, but will either remain on the surface, be exhaled by the heat of the sun, or conveyed off by the least current or declivity; or the ground will be so thoroughly soaked with, and retain the rain so much longer than hoed land, that the water will rather

rather chill than nourish the plants deposited therein.

A stiff soil will become so hardened, after the water is exhaled out of it, that it cannot receive any benefit from the air or other atmospherical influences, and will prevent the roots and tender fibres of plants from penetrating and extending themselves in search of food, when they most want it. Weeds, as being of a much hardier nature than plants, will thrive with less supplies, and grow so vigorous, as often to stifle and rob them of great part of that food, the soil before allowed them. Hence, instead of a plentiful, a scanty crop is obtained.

By the old, or common mode of husbandry, the whole tillage is given to the crop at the time of sowing or planting, without any farther provision being made, while the plants are advancing to maturity.

O

Hoeing,

Hoeing, is always practised by gardeners, and proved to be of the greatest utility in promoting the growth of all vegetables ; if therefore so advantageous in the garden, why should it not be as beneficial in the field ? Certainly, corn and pulse are as useful to the community, as any vegetables a garden can produce.

The advantages resulting from hoeing, are great and many. Facts are the strongest proofs, and such convincing arguments as cannot be refuted. Corn and pulse, when drilled at any distance, from six to twelve or more inches, may be hoed with a breast or running hoe, made of such a size as to cut the weeds, pulverise the ground, and add fresh nourishment by raising the earth to the plants without cutting them. In light land, a man, can with ease hoe an acre and a half in a day, between corn drilled at seven inches, which experience has taught
me

me is the most advantageous distance for producing the greatest crops.

By hoeing, weeds are destroyed, fresh earth is added to support the crop, the ground is so pulverised as readily to imbibe the dews and rains, and in the driest seasons, plants, are kept in a moister state than in land that is not hoed.

That tilled earth receives advantages from dews, which the untilled does not, is in the power of any person to be convinced of. In the month of July, or any other when the season is driest, dig a yard square of a bed in a garden, that had been tilled in February or March ; after five or six days, examine the tilled and untilled parts ; the earth in that part fresh dug, will be found moist, while the remainder of the bed not dug, will be found dry. It is just the same with tilled fields ; one part of a field, made fine by frequent plowings, will in dry

weather turn up moist, while the other part of the same land, that had been left rough, and not sufficiently plowed, will be dry.

When land is pulverised by hoeing, the air, dew, and rain have free access to the roots of plants, whose tender fibres may then readily, extend themselves to receive their nourishment, at seasons, when they stand most in need of it. Hoeing, also prevents the soil being long soaked with rain, which freely passes through the loosened earth, and the dews never suffer it to become perfectly dry; and by hoeing, the ground is partly prepared for a succeeding crop.

Another demonstration of the great utility of hoeing, must appear extremely obvious to every person. Were gardeners who pay from three to four pounds per acre for their ground, to plant vegetables without hoeing them, the natural produce, would
not

not pay the expences of seed and gathering, exclusive of the expences of tillage and rent; and the gardens, would soon become a perfect wilderness.

OF
ROLLING.

ROLLING, is the operation of drawing a roller over the surface of the land, to break the clods, and render it smooth.

Old pastures, as soon as broken up, clover, and all other vegetables when plowed in as manure, should be immediately rolled to close the earth, which will cause a speedy fermentation, rot the sward, and soon convert vegetables into a fertilizing manure. Rolling, is also of great utility on lawns and walks. It hardens the ground, and

and thereby prevents the free access of air to the roots of grass, which consequently cannot grow so luxuriant ; and by being levelled, the walks are the closer and easier mowed :—Those are the only advantages that appear to me from rolling.

Experience has instructed me, that rolling pastures, meadows, and grain, (even when most judiciously performed) is injurious ; particularly on stiff and loamy soils, which become so hardened and bound, that the roots of vegetables are excluded from the benefits of the air, and the land thereby rendered impenetrable to dew and rain, which run off, or are exhaled. And every experiment I have made on grass and corn, even in light soils, has convinced me that (particularly where corn is deposited at a certain depth by drilling) rolling, and the treading of the horses, adds tenacity ; and prevents the roots of vegetables from extending themselves in quest of nourishment.

The intent of plowing is to loosen and pulverise; rolling counteracts that operation, and undoes what had before been done; whereas harrowing, loosens the hardened, turf bound soil; admits the free access of air and benefit of manure to the roots of plants, by which a much more plenteous crop is obtained,

EXPERIMENTS

EXPERIMENTS

*Made to endeavour to ascertain the most profitable
METHOD of applying POTATOES to the
rearing and Fattening HOGS.*



AS swine, are one of the most increasing,
profitable, and sagacious* species of
animals that can be kept on a farm, they
most

* I have observed the sagacity of swine, to be equal to that
of any domestic animal. The too general barbarous treat-
ment of kicking and beating them, as if inanimate beings,
only tends to make them vicious and furious. I do not
permit

most deserve the husbandman's particular attention.

From experience, I have found that swine prefer lucerne to clover. Last year I had a small spot of lucerne adjoining to a field of clover, to both which they had free access. When drove into the clover, they would

permit any of my swine to be in the least abused, but give every encouragement to have them gently treated. By this mode, they will follow the boy who feeds them, like so many dogs; and will, even in the open field, lay themselves down to be smoothed and played with.

One of my labourers living near me, was lately employed on a common in front of my house. I observed his pig grazing near him all the morning. When the man went to dinner, the pig followed him, which induced me to be very attentive; and I found that the pig continued grazing within ten yards of him the whole day. On enquiry, I was informed, that he had not purchased this pig more than a fortnight before, when he was so unmanageable, that it was with difficulty he could drive him home; and that according to his usual method of the most gentle treatment, the man found that pigs could be so tamed, as to follow him wherever he would permit them.

would immediately return to the lucerne, which manifestly proves it to be a sweeter feed for swine. The superior advantages of lucerne to clover, are great and many. Lucerne, is not only earlier, and much more luxuriant in its growth, but will bear cutting four times in a season, and likewise flourish from fourteen to sixteen years longer than clover. The manure dropt by the pigs, tends greatly to enrich the land it grows on : hence I am fully convinced of its superior advantages to every other culture.

I have experienced, that neither lucerne nor clover are of themselves a sufficient support for the large Shropshire breed of swine. A small quantity of corn, pease, or beans, (particularly in cold mornings) is essentially necessary to be given them, before they are turned out. Such food will warm and strengthen their stomachs, and prevent the bad consequences of a disorder generally

generally called (in this part of the country) *the blood*;* which, from the following circumstance that occurred to me last April, I consider as an erroneous appellation.

My swine's feeding so heartily on lucerne and clover, prevented my bailiff's giving them any corn for some mornings. Soon after, I was informed that one of my pigs, near four months old, was affected with a disorder called *the blood*. I immediately attended, found the pig extended on the grass, in rather an insensible state, with its dam near it, in a seemingly condolent manner, bewailing the situation of its offspring. I ordered the pig to be put on its legs; it hung down its head, staggered, and again laid down. Its belly appeared to be full, and as my people as-
fured

* Described to me, to be the overflowing of the blood to the heart or head, where its circulation is impeded.

fured me it was *the blood*, according to the general custom practised in this part of the country, its tail was cut, which bled a little. I had it carried to the sty, where it was followed by the dam. Then I ordered some barley meal to be immediately scalded, and mixed with milk, which it would not eat, nor could any quantity be conveyed into its stomach by drenching. I tried several other methods to relieve it, but ineffectually. In a few hours after, it died. From the appearance of its belly being full, I suspected it must have eaten some poisonous weeds, or swallowed some venomous insect; curiosity induced me to examine its viscera, and with all possible circumspection; I first had its distended stomach opened, which contained only an elastic air, and a very small quantity of the meal, and milk which was curdled. I took the same precaution in having its intestines opened, all which contained nothing but the same elastic air as the stomach.

mach. All its viscera were perfectly found.

Hence, after the most minute investigation, I found that the disorder proceeded, not from the overflowing, but from the real want of a sufficient quantity of blood, arising from the want of solid nourishing food.

To prevent the other pigs being similarly attacked, I lost not a moment's time in preparing scalded barley-meal, which was mixed with milk, and given them blood warm, with a small quantity of spirits of hartshorn; at first I fed them but sparingly, and by degrees increased their quantity of food, till I thought them out of danger. Every morning after, I had them fed with corn before they were turned out; by this precaution they throve well.

Hence,

Hence, I am fully convinced, that lucerne or clover, without the assistance of some solid food, is not sufficient to support and nourish large swine; and that the diseases they are subject to, chiefly arise from improper unwholesome food, such as damaged fusty grain, (too frequently given them) or common dirty wash, or the stale offal of the garden, which in general is esteemed good enough for pigs.

I have applied potatoes in different modes for feeding swine; given them whole, or mashed in the water wherein they were boiled; or the last mode with barley meal* scalded and mixed in the trough. But from various and repeated experiments, I have found the following, the most profitable method of applying potatoes, to
not

* Whole peas, beans, or any grain, frequently pass through hogs in an indigested state, therefore should always be ground.

not only the *rearing*, but likewise to *fattening* of hogs; varying the quantity given, according to the circumstances of rearing, or fattening.

When rearing, a small quantity of food given once or twice a day, with lucerne, clover, grafs, and offals, is fufficient.

When fattening, a constant fupply is effentially neceffary, fo as not to leave the troughs encumbered with ftale meat, which fhould be cleared out, and given to ftore fwine.

An iron furnace, is the moft falutary for boiling potatoes. Should time or conveniency not permit to have it emptied for feveral days, no bad confequences can enfue.

Copper, or copper and lead, are extremely dangerous, as they generate poifon; therefore,

fore, they should be immediately emptied and cleansed.

The method I have lately adopted, and always shall pursue, until a better be pointed out, is, to fill about three parts of a furnace with potatoes; when, in proportion to every five bushels of potatoes, I scatter over them, about a peck and a half of barley-meal, then fill the furnace with potatoes, adding, just as much water as will cover them. By this method, the barley-meal does not sink to the bottom of the furnace, where it will encrust and burn, nor will it be liable to be wasted by being boiled over. The nourishment of the barley is in a great degree extracted by the water, and after the potatoes are well boiled, let the whole be mixed and bruised together in tubs, with a clean spade, so as to form a pulp. By this method, all the nutritive properties of the barley and potatoes are incorporated, and thereby much easier digested. Broths, and soups are never

P made

made but by boiling the meal or ingredients in the water. Were the different articles to be mixed with boiled or scalding water only, their nourishment could not be extracted, consequently, would be very insipid, and not so nutritive. By this mode, the hogs require no water. In cold weather, their food should be given blood warm. My barley, which was stained by the inclemency of the season in 1785, had been ground, and used for this purpose; which prevented my purchasing *gurgians*, which are nearly, if not equally as nutritive as barley-meal, and much cheaper.

Swine, when fattening, should be kept as clean as possible, and well supplied with dry litter. As their pens are generally too small to admit of exercise, and as they immediately lie down after feeding, I have thought it necessary, twice or three times a week, to add about three table spoonfuls of salt, to a half bushel pail of food; which assists digestion, consolidates their food,

food, and increases their appetites. When too great a quantity of salt is given, it then acts as a purgative, which prevents their food conveying the necessary nourishment.

About once a week, I have mixed two spoonfuls of madder, which prevents obstructions, acting as a diuretic, and is at the same time an astringent. And on some other day in the week, I give a spoonful or two, of an equal quantity of flowers of sulphur and salt-petre, well pounded and mixed; which purifies and cools the blood. All these different articles, added to each pail of food in the morning, on separate days, entirely prevent the meazles, keep the swine extremely healthy, and fatten them more expeditiously.

When some of my hogs were first penned up, they were affected with a violent cough, vulgarly called the *busk*; which the above ingredients

ingredients entirely removed in a very short time.

It frequently happens, that swine are killed when disordered with the meazles, which is easily discovered, by the meat or flesh, containing small globular red or white pustules of different sizes, varying according to the different degrees of the disease; which, originates from their being fed with musty damaged corn, or some unwholesome food; or from being boiled in lead or copper vessels, in which it has lain too long; or from their being kept in a wet or dirty pen: either of which causes, tends to obstruct the free circulation of the fluids; hence, arise those globular pustules, which are the juices rendered viscid and coagulated.

The different articles that I have as above pointed out, will entirely remove such obstructions; purify and promote the circulation

lation of all the fluids; and tend greatly to expedite the fattening of hogs.

I must farther observe, that hogs, from the age of twelve to eighteen months, are the most advantageous to be fed for bacon, as they have then attained their full growth, will require less food, and fatten much more expeditiously than hogs that are younger.



EXPERIMENT ON PORKERS.

Expences on Pigs, purchased March 17, 1785.

	£.	s.	d.
Paid P. Highman, for 5 porkers,	3	12	6
Expences at, and driving from } market, - - - - - }	0	1	3
Six bushels of barley (tailings) } and grinding, - - - - - }	0	16	6
Coal, - - - - -	0	1	3
Forty bushels of Potatoes, - -	0	7	6
P 3	4	19	0
	<i>Pigs</i>		

Pigs sold in April, 1785.

<i>Apl.</i>		Score.	lbs.
21.	Two to William Hughes,	5	7
28.	Three ditto, - - - -	10	6
Scores Total, -		15	13
		£.	s. d.
At 6s. 6d. per score, -		4	19 0

OBSERVATIONS.

The potatoes were unfizable for the Bristol market, as being the largest and smallest. They were put out of the furnace into tubs, and the barley-meal given promiscuously with the potatoes, without being mashed. I could have sold those unfizable potatoes, at eight-pence per bushel in the country; but by this mode of application, I was only paid two-pence per bushel, and two-pence over on the whole. Hence, I am convinced, young porkers will

will not pay for being fattened with potatoes, *by this method.*



EXPERIMENT ON BACON HOGS.

Pigs farrowed. { 6, Jan. 14, 1785.
 { 9, Feb. 17.

1785.	Hogs.			
Nov. 9.	Penned up to fatten,	12		
16.	Ditto, - - - -	2		
Dec. 26.	Ditto, - - - -	1		
		15		
		—	£	s. d.
	* Valued at - - - -	15	0	0
Coal,	- - - - -	0	11	6
14 bush. barley (stained) at 3s.		2	2	0
	Carried over, -	17	13	6
	P 4			Brought

* These hogs were driven to Bristol market, the 27th of October, when I was offered no more than eighteen shillings each for them. I have valued them at twenty shillings each,

ON FEEDING SWINE.

	£.	s.	d.
Brought over,.....	17	13	6
Grinding the barley,.....	0	3	6
1½lb. madder 13½d. salt 4s. 6d.....	0	5	7½
Flowers of sulphur and salt-petre, ...	0	1	1
306 bushels unfizable potatoes, which } is rather more than 14d. per bushel, }	17	17	9½
	£.	36	1 6

HOGS SOLD.

1785-6.	Score.	lbs.
Dec. 7. Two to W. Hughes,.....	13	0
28. Three to ditto,	22	0
31. Three to S. Collard,.....	23	11
Jan. 4. Three to A. Parker,	20	16
12. Three to ditto,	22	12
Feb. 10. One to ditto,.....	9	1
Scores Total,	111	0
	£.	s. d.
At 6s. 6d. per score,.....	36	1 6

OBSERVATIONS.

OBSERVATIONS.

The best season, for purchasing hogs at the Bristol market, is, about the latter part of October or beginning of November, when the milk season is expired, and all the corn fields gleaned. Therefore, I could have bought hogs of the same size as above, at the time mine were offered for sale, for about eighteen shillings, to not exceeding nineteen shillings.

My hogs, were only nine and ten months old when put to fatten; had they been full grown, I am convinced, they would have paid much more than fourteen-pence per bushel for the potatoes they ate.

The potatoes, were of the Surinam sort, and entirely unfizable for the Bristol market, as being the smallest and largest. Most of the last sort were watry and hollow, weighing from one pound and a half
to

to three pounds; worth (if sold in the country) from seven pence to not exceeding eight-pence per bushel.

The barley being stained, malsters, and distillers refused to purchase it; and the highest price offered me for it, was three shillings per bushel, for the purpose of fattening hogs.

I could have purchased gurgians at two shillings and three-pence per bushel, which I apprehend would nearly, have been as nutritive as barley-meal; and thereby enhanced the value of the potatoes more than a half-penny per bushel. Ten shillings and six pence, being the difference of the cost of barley meal and gurgians.

Hogs, that are full grown, yield a greater profit in feeding, than smaller ones; they also increase more in weight, and eat less food in the last month or six weeks of their
fattening

fattening; and, during that time, a gradual increase of meal, should be added to the potatoes.

I have omitted making any charge for attending these hogs, as I deem the manure they have made, equal in value to such expence.

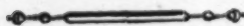
EXPERIMENTS

ON

TURNIPS.



First Experiment.



AS turnips are the basis of agriculture in many parts of this kingdom, particularly on light soils; and as the fly too frequently destroys the young plants, before they grow into rough leaf, by which the industrious farmer is materially injured, being sometimes obliged to seed the ground three times, and at last disappointed of a crop for the support of his sheep in the succeeding spring. Therefore, in order to find out a remedy, for the preservation of
so

so useful a vegetable, I made such experiments as I deemed most convenient, for any farmer to put in practice.

On the eleventh of May, 1786, I sowed early Dutch turnip-feed, on a bed in my kitchen garden, in drills, twelve inches distant from each other, near two inches deep. This bed had been manured with rotten dung in 1785; afterwards planted with cabbages. The soil a stiff loam. The seed was steeped or mixed with sundries, as under, six hours before sowing, and each drill marked with stakes : viz.

No.

1. Seed, without any preparation.
2. Dry seed mixed with foot.
3. Ditto steeped in Barton draining.
4. Ditto, water out of a dunghill.
5. Steeped feed, with stale human urine.
6. Ditto, lime and Barton draining.

No.

No.

7. Steeped seed, with foot and water.
8. Ditto, foot and Barton draining.
9. Ditto, elder-leaf juice.
10. Ditto, elder-leaf juice and Barton draining.
11. Soot, sowed over the covered drills.
12. Lime ditto.
13. Seed mixed with flaked lime.
14. Scattered foot over, then covered.
15. Scattered lime over, and then covered.
16. Elder bush drawn over the plants.
17. Seed, steeped six hours in train oil.
18. Ditto, in linseed oil.

The linseed oil was taken out of a bottle, that had contained oil of turpentine, for painters use.

Examined

Examined on the 26th of June, and remarked as under : viz.

No. 17 and 18 were far superior to the others.

No 4, 7, 8, and 10, second best.

No. 2, 9, 11, 12, 14, third best.

No. 6, no vegetation.

No. 5, 13, and 15, very few plants appeared.

No. 16, same as No. 1, which with all the others, were inferior to the third best.

The fly appeared on each experiment, but did no real injury to No. 17, which grew so luxuriant, as to produce rough leaves several days, prior to the most flourishing of the others, and so continued to maturity. The leaves of No. 17, in particular, appeared to be fat, and twice as thick and strong as any other, except No. 18,

18, that was very little inferior; which I presume, might have been owing to the small mixture of the oil of turpentine that remained in the bottle.

Second Experiment on Turnips.

On the 20th of June, 1786, I drilled green Norfolk turnip seed, near two inches deep, at one foot distance in the rows, on beds, eight feet three inches long, and two feet wide. The soil a stiff unmanured loam, in the corner of a field, fronting the south; it had been Winter and Summer fallowed to the time of sowing. Weight of the seed half a drachm to each bed, mixed or steeped with sundry articles as follows: in order to endeavour to ascertain, the most effectual remedy, for preventing the fly destroying the plants. All the different experiments were mixed with a pint of sifted earth,

earth, immediately drilled, and marked with stakes : as follows :

No.

1. Mixed with foot, - $\frac{1}{2}$ an oz.
2. Soapers' ashes, - - ditto.
3. Wood ashes, - - - ditto.
4. Pounded gunpowder, ditto.
5. Brimstone, - - - ditto.
6. Slaked lime. - - - ditto.
7. Soot, and train oil, - $\frac{1}{4}$ oz.
8. Soaper's ashes, - - ditto.
9. Wood ashes, - - - ditto.
10. Gunpowder, - - - ditto.
11. Brimstone, - - - ditto.
12. Slaked lime, - - - ditto.
13. Soot, and linseed oil, - ditto.
14. Soapers' ashes, - - ditto.

Q

No.

- No.
15. Wood ashes, - - - $\frac{1}{4}$ oz.
 16. Gunpowder, - - - ditto.
 17. Brimstone, - - - ditto.
 18. Slaked lime, - - - ditto.
 19. Brimstone and salt-petre, well incorporated.
 20. Brimstone, and $\frac{1}{4}$ oz. linseed oil.
 21. Ditto and ditto, train oil.
 22. Brimstone, and Barton draining.
 23. Linseed oil.
 24. Train oil.
 25. Soot, - sowed over the bed.
 26. Soaper's ashes - ditto.
 27. Wood ashes, - ditto.
 28. Slaked lime, - ditto.

No.

No.

29. Linseed oil, and the covered drills scattered over with foot, when the plants began to appear on the surface of the ground.

30. Train oil, ditto.

The seed was steeped or mixed six hours, in each ingredient, and the oil strained through a fine sieve.

On the 17th of July, 1786, I particularly examined all the beds; none had entirely escaped the fly, the least injury was done to No. 30, 29, 24, and 23; which grew so luxuriant, as to produce rough leaves several days prior to the most flourishing of any of the other numbers, by which they were better enabled to withstand the fly's attack. The linseed oil, was the same as that used in the first experiment, its effect was inferior to that of train oil; which I do impute to the drying properties of the turpentine. The

Q₂

leaves

leaves of the seeds steeped in the oils alone, were of a much darker green, appeared twice as fat or thick, and the plants were a considerable degree larger than any of the others; and, in point of luxuriance they stand as under. Accordingly I presume, that the smell of the foot must be disagreeable to the fly, as No. 30, and 29 remained the longest without being attacked, although the injury they did to 30, 29, 24, and 23, were scarcely perceivable, and did not at all impede their growth,

No. 30, 29, } Were far superior to all the
24, and 23, } others.

No. 3, 5, 11, 17, } Were more luxuriant
22, 25, 26, 27, } than any of the re-
7, 13, and 19, } maining numbers.

On the 8th, 19th, 31st of July, and 4th of August, I made several other experiments with turnip seed, barley, wheat, peas,

peas, and beans, steeped 6, 12 to 24 hours, and so long as ten days; the seeds were sown broad cast, and drilled. In every experiment with the turnip seed, I observed, that what was steeped in the oil a less time than twenty-four hours, and immediately sown with sifted earth, vegetated much better than the seed that had been longer steeped. That steeped for ten days vegetated less than the seed sown without any preparation. I found that oil, in every experiment, proved injurious to barley, wheat, peas, and beans; and that the grain sown in its natural state, vegetated best. Therefore as oil so peculiarly promoted the growth of turnips, and proved injurious to barley, wheat, peas, and beans; curiosity induced me, first, to examine through a microscope, the structure of turnip seed, which appeared spongy; from whence I conclude, that in consequence of turnip seed being generally sown in the hottest and driest season of the year, the heat and dry-

ing winds penetrate the pores, consequently, greatly injure the vegetative properties of the seed. Hence, the plants grow sickly, become simlar to blighted vegetables, and are thereby rendered an easy prey to the fly. Whereas oil enters and fills the pores, protects the germinating properties of the seed from the scorching heat, and drying winds; thus by being preserved, a little moisture makes the seed vegetate with such luxuriance, as very speedily to grow into rough leaf, when it generally becomes too powerful to be materially injured by the fly.

On a strict examination of the grains of barley, wheat, peas, and beans, I found they were protected by an oily coat or skin, which, I presume, defends their germinating properties from heat and scorching winds; and that the oil (in which the seed is soaked) tends to harden the grain, already sufficiently protected by its natural covering.

covering. To what other cause can we attribute it? Future experiments, and a more able investigator, may better account for such effects.

Oats, are doubly guarded, by a thick oily shell, which when taken off, the inward grain, appears to be again protected by an oily skin, covered with something similar to long hairs, extending from one end to the other, and forming a bushy tail. I believe it is generally acknowledged, that oats are diuretic, and more heating than any other grain. May it not be owing to these small hairy particles being indigestibly carried into the blood?

ON THE
INCREASE
OF
GRAIN.

A Single cluster of barley, growing in a field planted with peas, attracted my attention. The numerous stalks appeared to be the produce of several grains, but when pulled out of the ground, I clearly perceived they were only the produce of a single grain, which had been dropped by accident ; curiosity induced me to count the number of ears, which were twenty-eight

eight, containing in the whole three hundred and thirty grains. Such an amazing increase astonished and made me reflect, if one grain produced upwards of three hundred, how came it that farmers could procure no more, and were well satisfied in obtaining a crop of from thirty to forty bushels per acre, from four bushels of seed, sown in a loamy or stiff soil? The greatest of such product is only ten for one, and of course less by three hundred for one than the produce of the single grain. Being fully convinced that the old mode of cultivation was very erroneous, I determined to endeavour to find out where the errors lay. I had a Winchester bushel of barley measured, it weighed fifty-two pounds and a quarter, and according to the number of grains in one ounce, the whole bushel contained five hundred and fifteen thousand grains.

I next

I next had a Winchester bushel of wheat measured, it weighed sixty-two pounds, and contained five hundred and sixteen thousand grains.*

A bushel of poplar peas weighed sixty-four pounds, contained one hundred and seven thousand peas.

A bushel of horse beans weighed sixty-four pounds, contained thirty-five thousand beans.

A bushel of oats weighed thirty-two pounds, contained one million two hundred and sixty thousand grains.

EXPERIMENTS

* I have since weighed wheat and barley, which contained from three to seven thousand grains more per bushel than the above, which ought to be deemed the largest size.

EXPERIMENTS

ON

BARLEY.

HAVING thus far proceeded, I next reflected, that admitting every grain sowed was to vegetate, and produce no more than even twenty for one, the produce of four bushels of seed ought to be eighty bushels per acre. Therefore was fully determined as soon as possible, particularly to investigate the future growth of grain. Opportunity did not permit my making

making any experiments till the following spring, when I had beds dug eight feet three inches long, and two feet wide, which occupies a space of one sixteenth part of a square perch. I thought it necessary for my future conduct in Agriculture, to reduce the weight of the bushel of barley, being fifty two pounds and a quarter, into drachms, that I might the better be enabled to proportion to an acre, the quantity of seed most advantageous for drilling, and sowing broad cast; accordingly found that fifty two pounds and a quarter, contained thirteen thousand three hundred and seventy six drachms. I then reduced an acre into sixteenths of a perch, being two thousand five hundred and sixty; and dividing the drachms (thirteen thousand three hundred and seventy six, the contents of the bushel,) by the number of sixteenths, (being two thousand five hundred and sixty in an acre,) found the quotient to be $5, \frac{2,560}{576}$ part of a drachm.

drachm. Therefore, on the 17th of April, 1782, sowed broad cast five drachms and a quarter, as being the nearest proportion of one bushel, Winchester measure, to an acre of land, on the first bed; and in proportion to two, three, and four, on the following beds.

The soil was a stiff unmanured loam, had been cropped with peas in 1781, was winter fallowed and dug a spit deep. The grain was dropped by hand in the drills two inches deep, as under.

No.	Weight.
1 sowed broad cast, - . -	5 $\frac{1}{4}$ drms.
2 ditto - - - - -	10 $\frac{1}{2}$ ditto.
3 ditto - - - - -	15 $\frac{3}{4}$ ditto.
4 ditto - - - - -	21 ditto.

No.

No.	Weight.
-----	---------

Four drills in each bed with six-inch intervals.

- | | | | | |
|---|--------------------------|---|----|--------|
| 5 | two grains to an inch, | - | 19 | drms. |
| 6 | one grain to an inch, | - | 9½ | ditto. |
| 7 | one grain to 1½ inch, | - | 6¼ | ditto. |
| 8 | one grain to two inches, | - | 4¾ | ditto. |

Three drills in each bed with eight inch intervals.

- | | | | | |
|----|--------------------------|---|----|--------|
| 9 | two grains to an inch, | - | 14 | drms. |
| 10 | one grain to an inch, | - | 7 | ditto. |
| 11 | one grain to 1½ inch, | - | 5 | ditto. |
| 12 | one grain to two inches, | - | 3½ | ditto. |

Two drills in each bed with twelve inch intervals.

- | | | | | |
|----|--------------------------|---|----|--------|
| 13 | two grains to an inch, | - | 9 | drms. |
| 14 | one grain to an inch, | - | 4½ | ditto. |
| 15 | one grain to 1½ inch, | - | 3 | ditto. |
| 16 | one grain to two inches, | - | 2½ | ditto. |

No.

No. Weight:

Two drills on three feet beds, with
intervals of fifteen inches.

- | | | | |
|----|---------------------------------------|----------------|--------|
| 17 | two grains to an inch, - - | 9 | drms. |
| 18 | one grain to an inch, - - | $4\frac{1}{2}$ | ditto. |
| 19 | one grain to $1\frac{1}{2}$ inch, - - | 3 | ditto. |
| 20 | one grain to two inches, - - | $2\frac{1}{4}$ | ditto. |

August

August 23, 24, and 25,
Cut the several Beds.—Produce as follows :
No.

1	— 184	drachms, or 35 bushels per acre.
2	— 207	—— 39 ditto.
3	— 261	—— 49 ditto.
4	— 289	—— 55 ditto.
5	— 401	—— 76 ditto.
6	— 443	—— 84 ditto.
7	— 389	—— 76 ditto.
8	— 391	—— 74 ditto.
9	— 372	—— 62 ditto.
10	— 378	—— 72 ditto.
11	— 315	—— 60 ditto.
12	— 310	—— 59 ditto.
13	— 291	—— 55 ditto.
14	— 300	—— 56 ditto.
15	— 267	—— 51 ditto.
16	— 250	—— 47 ditto.
17	— 284	—— 36 ditto.
18	— 289	—— 37 ditto.
19	— 278	—— 35 ditto.
20	— 269	—— 34 ditto.

Thus

Thus the produce of No. 6, being in proportion to upwards of eighty-four bushels per acre, is superior to any other ; which, by this experiment proves, that the most advantageous distance between the rows is six inches, with the grains about an inch asunder in the drills.

Every experiment was left without being hoed or weeded, that I might the better be enabled to observe the growth of weeds ; the six-inch intervals contained few or none. When the corn was cut, the ground, on which the six-inch drills grew, appeared more hollow, blacker, and moister, than the wider intervals ; and according to the increase of distance between the drills, so in proportion was the increase of weeds, and dryness of the soil.

The roots of No. 6, in particular, and No. 9, were so matted or combined together, as to keep the soil more hollow, and

R

had

had extended themselves farther than any of the others; and I presume, that the thickness of their shade at six inches distance, prevented the moisture being exhaled, which caused a kind of constant fermentation in the soil. Hence, the ground appeared more hollow, moister, and blacker, than between the drills at greater distances.

In the year 1783, I made several experiments on a small scale, by drilling and sowing grain alone, and immediately mixed with wood, coal, soapers' ashes, flaked and unflaked lime, soot, and rotten dung; and in all my experiments, which are too trifling and numerous for insertion, it is sufficient to observe, that the above mixtures produced less crops in proportion to the corrosive properties of the manures; and that the dung made the straw grow so luxuriant, as to produce small heads, as also more liable to be beat down by heavy storms of rain; and every species

species of grain and pulse sowed alone, produced in every instance, (excepting the wood ashes, which encreased the crop) a greater increase, than when mixed immediately with the manures, which I am thoroughly convinced should be well incorporated with the soil, some little time before the grain or pulse is sown.

Farmers, in general prefer small to large grain for feed, being of the opinion that small grain better stocks the land, and produces the most plentiful crop. I have planted single grains of different species and sizes, and have always found that the larger and plumper the grain, the greater was the produce; and most of the large grains vegetated, while twice the number of the smaller failed.

On the 9th day of June, 1786, I again made forty-three different experiments on early barley, by sowing broad cast, and

R 2
drilling

drilling at various distances, with different quantities of seed, on beds eight feet long, and two feet wide; the soil a strong loamy clay, manured only with the ashes of the couch grass, which it contained. This trial, tho' so late, was further made with a view of being better able to ascertain the most advantageous quantity of grain to be sowed, and distance between the rows.

The season being warm, dry, and so far advanced, I had all the beds watered, and having no rain for some time after, the barley vegetated very irregularly, altho' every care was taken to water it with garden pots, as equally as possible. The barley ripened very late, the ears were of a middling length, but the grains were very small, and one half the crop eaten by the birds, tho' every effort was used to keep them off. Thus, I was disappointed in attaining a knowledge of the crop; but from the quantity of straw, and the appearance

pearance of the grain, this experiment corresponded with the other. Therefore I am so far convinced, that barley and wheat drilled, at about six inches distance, between the rows, produce the greatest crops, and the land is left in the best and cleanest condition.

Experience instructs me, that the quantity of seed sown should be governed by the poverty or richness of the soil. The poorer the land is, the greater quantity of seed should be sowed; because the poverty of the soil does not afford sufficient nourishment to strengthen and enable the roots and tender fibres to extend themselves, consequently the plants tiller less. Hence, on the contrary, the richer and better condition the soil is in, the less quantity of seed is required; because, the roots and tender fibres acquire such nourishment, whereby they are strengthened and enabled to extend themselves, in proportion to the

richness of the soil ; and of course, the plants tiller the more, the stalks are also stronger, produce greater crops, and as having more extended roots, which answer the purpose of a sheet anchor, are better able to withstand the heavy storms of winds and rains. But when the seed is sown too thick, particularly broad cast, the crop is deprived of the free access of air, the plants grow tall and weak, are soon laid by storms of wind and rains, and the produce is generally scanty. Hence, the quantity of seed sown should be wholly regulated, in proportion to the richness or poverty of the soil.

In all my experiments on wheat and barley, drilled at the same equal depth, and where the grains were planted two inches apart in the rows, I could visibly discover that many grains, even of the largest size, never vegetated ; which induced me to make several experiments with steps ; to recapitulate

recapitulate the whole, might tend to bewilder the imagination. Therefore, I will only observe, that I have found the following to be the most fertilizing, and effectual to prevent blights or smut: viz.

Take one peck and a half of wood ashes, and one peck of unslaked lime, which put into a tub that will contain about forty gallons of water, then add as much water as will flake the lime, and render the mixture (which should be well incorporated) into the consistence of stiff mortar, in this state it should remain ten or twelve hours; afterwards add as much water as will reduce the mortar to a pulp, by stirring; then fill the tub with water, which must be stirred for two or three days; then draw off the clear lye into a proper vessel, and gradually put the grain into it, skimming off the light corn; after the corn has steeped three hours, let it be taken out, and immediately spread on a clean floor

to dry, when it will be sufficiently prepared for drilling or sowing. The lye will retain its full virtue, and the same may be repeatedly used,

As all the grains appeared plump and healthy when planted, I presume that those which did not vegetate, must have been bruised in threshing, or trod upon when winnowed; to prevent the latter, I oblige my threshers to winnow seed wheat with their shoes off. But further investigations may be easily made to ascertain this point.

On examining the grains of wheat and barley through a microscope, I have frequently observed small quantities of black powder on the flat or hollow part, or on the downy end of the grain, but too minute to discover by my glass, that they were animalcules.

As

As I deem the practice of common brining to be only useful for destroying small insects, (invisible to the naked eye) which grain frequently harbours ; in order to discover what effect the steep lye would have on insects, I procured several common red worms ; I carefully chose two, alike in size and strength, one was put into a glass of spring water, the other into a glass of the lye ; the last immediately appeared to be in great agonies, and died within forty minutes. The worm that was put into the spring water, was alive and active at the expiration of three weeks, when it was thrown into the street.

From this experiment I conclude, that as the lye operated so violently on an amphibious insect, animalcules, that are not amphibious, must naturally be destroyed in a much shorter time. And in every experiment, I have found that lye, when it
has

has not been too strong, has promoted the growth of corn and pulse; when, on the contrary, oil has proved injurious.

IMPERFECTIONS.

IMPERFECTIONS

OF THE

OLD MODE OF CULTIVATION

POINTED OUT.

MY next attention was to the sowing of
of wheat, two bushels of seed per
acre, on a clover lay ; the soil a loam,
about seven or eight inches deep, on a stone
brash clay. The ground was perfectly dry
the first day of sowing, the seed appeared to
be

be well covered by frequent harrowings. Very heavy storms of rain fell the succeeding night, the next morning I observed the birds and rooks very busy on the part that had been sown, which on examining, I found the heavy storms that had fallen in the night, had washed off the mould, and exposed great quantities of the wheat on the surface, which the birds and rooks were feeding on : this partly accounted for a deficiency of produce. On this same day, my servants sowed the remainder of the field ; the land was so thoroughly moistened with the rain that had fallen in the night, that it was obliged to be harrowed more than the other to cover the seed, by which I observed the horses feet sunk deep in the earth ; and on a future investigation found, that great part of the seed had been buried by the treading of the horses, and never vegetated, but was rotted by the water being retained in the tracks of the horses

horses feet. Several other similar remarks, confirmed the impropriety of such conduct on loams and stiff soils. One further instance in particular, will, I trust, suffice, leaving the industrious Agriculturist to improve from the advanced hints. I accidentally passed through a neighbouring farmer's field, where he was sowing barley, the soil a good rich stiff marly loam ; four heavy oxen drew one pair of harrows several times over the same spot, with an intent that the seed might be effectually covered, and the land made fine. In a few days after, the field was rolled with a heavy roller, drawn by the same heavy oxen ; I observed that the land was greatly hardened, and that the oxen's feet had made a most visible impression in the ground, which could not be levelled by the roller.

I particularly attended to the vegetation of the grain, and observed that on those spots

spots where the oxen had trod, the seed did not germinate ; and when the barley ripened, the straw was short, few ears contained more than twenty grains. In short there was not half a crop.

NEW

NEW

MODE OF CULTIVATION

POINTED OUT.



THOSE circumstances discovered to me in repeated instances, the imperfections of the old or common method of cultivation. Hence, knowing the cause, reason suggested that it should be necessary to endeavour to find out a remedy; or rather that the old mode should be discontinued, and if possible, some new or better method of culture should be

be adopted. By observations and close attention, I soon succeeded. I fixed together with a poll, three harrows, which when measured, I found would compleatly cover the breadth of eight feet.

I accordingly had my fields formed into eight feet ridges, the three harrows compleatly covered these ridges; and instead of the horses treading the pulverized land, four horses were parted, two walked in the furrows each side of the ridge, by which the soil was properly harrowed without being trod or hardened, and the ground made sufficiently fine.

The repeated trials I have made of this *New Mode of Culture*, has sufficiently confirmed me of its utility. One recent experiment will, I presume, as well as one hundred, illustrate its superior advantages. The field, No. 4, that had produced (as per p. 140) two successive crops of potatoes, the

the last of which could not be got out of the ground till the latter end of November; particular business intervening, prevented the land being got into proper order before the 16th of December, 1785; as the field measured but four acres, and was in excellent tilth, curiosity induced me to sow it, even so late in the season, with cone wheat; for which purpose my drill machine was used upon a few butts or short ridges, which were planted with a proportion of one bushel to an acre, the rows at one foot apart, on ridges eight feet broad; but such an excessive heavy fall of rain commenced, as soon reduced the soil to a mere quagmire, the horses sunk to their knees in the ridges. Hence, the drill could not be worked.

Thus, part of the field being drilled, and no prospect of more favourable weather at so late a period of the season; my servants, and myself (attending the operation of the
S machine,)

machine,) were thoroughly wetted ; the weather being rather warm, my people continued in the field, sowed the remainder with two bushels and a half per acre, and even in such a wet state, harrowed in the seed, with three harrows covering the ridges, two horses walking in each furrow. And that I might be further convinced of the disadvantages attending the horses treading on the ground, I permitted two ridges to be harrowed by the horses walking thereon. In the month of January, the rooks did me much injury, which I observe, they always do on late sown wheat ; for when the ground is frozen and covered with snow, they cannot get at worms and insects on pastures ; in this case, these sagacious birds, instigated by hunger, scratch off the snow, whereby they discover the blades of the corn, and with their beaks soon get at the milky grain, which they feed on. But at particular periods, such as when plowing of land, and in wet weather, when worms appear on
the

the surface of pastures, rooks follow the plow, pick up the grubs and worms off arable and pasture lands, so far they are serviceable; but in dry weather, when the ground is hard, and no worms can appear, birds, more than animals, will not starve, but risque their lives in pursuit of that food which supports them.

In short, rooks are of service to pastures, but very injurious to the tillage farmer. And from repeated experiments, I know of but one method sufficiently effectual to destroy them.

In the month of May, I had the drilled wheat hoed, for which I paid after the rate of eighteen-pence per acre. The other part of the field was weeded, at an expence of about two shillings and six-pence per acre; and during the whole time of its growing, the drilled wheat visibly appeared superior, in every respect, to the broad cast;

cast ; the straw was in size similar to reeds, many measured upwards of six feet in length, and the ears contained from ninety to one hundred and twenty grains.

On the 12th day of September last, I had three perches each of the drilled, the broad cast by the new mode of culture, and the broad cast sown in the common way, carefully cut, carried into the granary and there threshed :

The Produce as under, viz.

Drilled.—Four pecks and half a pint ; or, per acre, fifty three bushels and three pecks.

Broad cast, new mode,—Three pecks and ten pints ; or, per acre, forty eight bushels, one peck, and five pints.

Broad

Broad cast, old mode.—Two pecks and six pints ; or, per acre, thirty one bushels, two pecks, and ten pints.

The whole Winchester measure.

The drilled, and broad cast by the new mode of culture, were cut from off ridges adjoining each other, which were at the distance of about five perches from the hedge. The three perches of the old mode of culture, were also near another hedge, all the ground they grew on of equal quality, and neither of these ridges injured by the rooks, who generally dropped near the middle of the field ; the crop thereof was threshed and winnowed in December, 1786, the whole produce of the four acres amounted to one hundred and fifty three bushels, being thirty eight bushels and one peck of nine gallon measure, or something more than forty three bushels of Winchester measure per acre. Hence, by computation from

the three perches cut off the new mode of broad cast, the rooks must have eaten as much seed as in all probability would have produced about five bushels per acre more.

This comparative view clearly illustrates the disadvantages attending the horses walking on the grain, after its sowed; which old mode produced near seventeen bushels per acre less, than by the new method of the horses walking in the furrows; and although the drill worked to every disadvantage, in what might be partly called mortar, with depositing only in proportion to about one bushel of seed, eight gallon measure per acre, and at twelve inches distance between the rows; yet it produced five bushels, one peck and eleven pints, more than the new broad cast mode, sown with two bushels and a half of nine gallon measure, of seed to an acre. And I am now confident, that if I could

could have drilled my wheat in rows at six inches, my crops would have been at least half as much more productive than they were.

EXPERIMENTS.

S 4

EXPERIMENTS

ON

WHEAT.

ON the 29th of November, 1785, I drilled a small field of two acres and a half (that had been cropped with hoed beans, which were carried off the land the latter end of October,) with two bushels and a half of cone wheat, two inches deep, at the distance of twelve inches between the rows. The soil a loam on a stone brash clay.

In

In the month of February, 1786, a dairy man's six heavy bull stags and dry cows, which were kept in such a manner as to be half starved, broke over a well secured fence into my field of wheat, which they eat and greatly damaged by trampling over every part. The impression of their feet was so great, that wherever they trod, the soil was so compressed, as to retain the water in the tracks, and the plants were entirely destroyed thereby.

In the month of March, the field was hoed. In the month of September, twenty eight of the same dairy man's turkies, which were permitted to live on the public, discovered their great sensibility by maurading in my field of wheat, where they most freely and plenteously regaled themselves. The field was surrounded with hedges, containing luxuriant trees and thorns, that harboured immense numbers of small birds, which (as is always the case,

case, in such small paddocks near a house,) eat an amazing quantity of the wheat whilst ripening, and particularly off such ridges as adjoined the hedges.

Nevertheless, under all these disagreeable circumstances, the crop was threshed out last month, and the whole produce was eighty four bushels and a half, which is about thirty four bushels of nine gallon measure, and equal to thirty eight bushels and a half of Winchester measure per acre. A pint weighed fifteen ounces and nine drachms, which multiplied by sixty-four, the contents of a bushel Winchester measure, its weight was sixty two pounds and four ounces, per Winchester bushel.

Had not the cattle, turkies, and birds done so much injury, I have not the least doubt, but that the produce of this field would have been near sixty, instead of
thirty

thirty eight and half, Winchester bushels per acre.

The advantages resulting from hoeing, induced me in autumn 1785, to drill my wheat at twelve inches distance between the rows; since that time, I have had hoes made of proper sizes to work between the nine and six inch intervals.

In the year 1785, the field No. 3, was drilled with beans after wheat. (See p. 146 and 127.) At so late a season as the 17th day of May, 1786, I drilled this field, which is the poorest land on my farm, with a bushel and a peck, Winchester measure, of Siberian or spring wheat per acre, full two inches deep, and at nine inches between the rows. It was hoed only once, was reaped the 23d of September, when I had three perches carefully cut, carried into the granary, and there threshed; the produce was two pecks and four pints, which

which is in proportion to thirty Winchester bushels per acre. About the middle of September, we had some very heavy storms of wind and rain, that beat great quantities of the wheat, which was then ripe, out of the ears; the grain appeared as if it had been sowed broad cast, and by the opinions of seven men, whom I then had reaping, there could not be less than near three bushels per acre scattered over the ground; however, I will call it two and a half bushels, which, with the proportion of thirty bushels threshed, makes in the whole, thirty-two and one half bushels per acre. No part of the corn was laid by all that tempestuous weather, so as to do it the least injury. Such are the superior advantages of drilling to broad cast; particularly, the nearer the rows are to each other, the better they are supported.

One caution I will beg leave to notice, that the grain of spring, or Siberian wheat,

is

is much more liable to drop out of the ears, than the grain of any other sort of corn. Hence, it should be particularly attended to, and cut before it is ripe.

Last autumn, I drilled wheat at Six, Seven, nine, and eleven inches distance between the rows: from the present appearance, that at six inches is superior to all the others; and if no particular accident happens, I have not a doubt of the six-inch intervals producing about seventy Winchester bushels per acre.

On the 18th of April, 1786, two ridges, measuring thirty-six perches, were drilled with carrot seed, at about one and a half to two inches deep, and one foot distance, between the rows; they were once hoed with a running hoe, and as I only intended to try how my machine would deliver the seed, the plants were neither thinned nor weeded. This experiment was made on
a very

a very improper soil, being a stiff loam. They were plowed up the second of November, the roots were very thick in the drills, but small in size, few measured more than about twelve inches in length; after the leaves were cut off, the produce was eighty-nine bushels.

As I then intended presenting the Bath Agriculture Society with an account of my produce, and the utility of my machine; I had a survey of my crops taken by the clergyman and churchwardens of the parish in which I reside.

The following is a Copy :

“ We, whose names are hereunto subscribed, the Minister and Church-wardens of the parish of Henbury, in the county of Gloucester, do hereby certify, that we have this day surveyed and particularly examined about eleven and one half acres of land, which

which was drilled with wheat, in equidistant rows of twelve inches asunder; which was hoed, and appeared perfectly clean from weeds.

“ We likewise certify, that the crops on the above lands appeared to us to be very flourishing, luxuriant, and far superior to any crops of wheat in this part of the country.

“ We also certify, that we have examined two ridges, which were drilled in equidistant rows of twelve inches, with carrots, that appeared very regular and flourishing; all which belonged to MR. WINTER, of *Charlton*, in the above parish, and were drilled by his machine, which we have examined, and it appears to us to be constructed on the strongest and most simple principles. We also certify, that we have examined his crop of barley, drilled in

in equi-distant rows of nine inches, and that is excellent.

“ In Witness whereof, we hereunto subscribe our names. Dated at *Charlton*, afore said, this fifth day of June, 1786.

(Signed)

HENRY DONNE, Clerk.

WM. OGBORNE, }
JOSEPH WHEELER, } Church-wardens.

THOMAS COOKE, Inhabitant.”

Having observed the imperfections of the old mode of culture, and endeavoured to point out a remedy; I must now revert to my experiments on barley, (p. 254) which corresponding with the different quotations from such respectable authors, left no doubt remaining, relative to the superior advantages resulting from the drill, to the common broad cast mode of husbandry; and as

I could

I could not procure such a machine as suited my inclination; in the month of January, 1783, I constructed one, which in theory appeared likely to answer my expectations; but when put into practice, was extremely incomplete. I then altered my plan, and taking the hint from a mill, I again employed a carpenter at my leisure time, and in about twelve months after, made one to drill at twelve inches, which at first I deemed complete, and accordingly set it to work, but was again disappointed. However, by great perseverance, and the most strict attention for whole days, to its working in the field, I was thereby enabled, from time to time, to discover and rectify its imperfections.

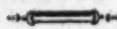
As I observed the distance of about six inches to be the most advantageous between the rows, I fastened the six coulter on the coulters bar, but found that the space between the coulter was only about four
T inches ;

inches ; consequently stones, clods, and weeds soon choked them. Being thus chagrined at my disappointment, and much fatigued, I seated myself on a sack containing the seed, on the head land : A pair of harrows were placed upright against the adjoining hedge ; I observed some of the tines were lost or missing, which on examination, I accidentally noticed the triangular working position of the tines ; I was so struck with the idea, that I lost not a moments time in sending for my carpenter, and had an additional coulter bar immediately made ; three coulters remained on the old bar, the other three were fixed on the new bar, and in the center of the coulters on the old bar ; which then formed an angle, and space of twelve inches between all the coulters. By being thus set, none of the coulters were clogged ; large stones, clods, and weeds passed between, and the machine worked with pleasure in the roughest and most stony land,

land, where the stones did not exceed seven or eight inches in diameter.

Thus, after being at a great expence, upwards of three years study and close attention to its executive powers in the field, I at last succeeded beyond my most sanguine expectations, in the invention of a most strong and simple machine; and such, as any person at the first view, would naturally suppose, might be invented in three months, instead of three years. But, were the several alterations which I made during that period to be minuted, I am fully convinced they would be sufficient to fill a large volume.

THE
DESCRIPTION AND USE
OF A
PATENT DRILL MACHINE,
INVENTED BY
THE AUTHOR.



References to the annexed PLATE.

FIG. I.

REPRESENTS a front view of the machine when at work, with six coulters fastened on.

A The

A The fore flap is turned up, and the back board taken off, for the purpose only of representing the inside work, which when drilling in the field is all enclosed ; it then appears as a chest or box between two wheels, and all the inside work is perfectly secured from the effects of the most tempestuous weather.

B The Frame.

C Iron plates, in which the gudgeons of the fore wheel are placed. In this position, by having the wheel fixed in the upper hole, all the three wheels are on a level with each other. But when the fore wheel is to be set for the purpose of travelling, it is instantaneously removed into the lowest holes of the plates, by which the coulters will be elevated about five inches above the surface of the ground, and by means of temporary iron wheels, (which are occasionally fixed into the back part of

the frame, for removing it from one field to the other,) the large wheels with the spikes, are also elevated so high, as to be on a level with the coulter.

D D the two hind wheels with spikes, which are for the purpose of preventing the wheels from sliding over rough ground or clods; and by the spikes penetrating into the earth, the wheels are forced round, by which the grain is delivered; for when the wheels stop, no grain is discharged.

E E Iron rings, fastened to the fore standards, to which the traces or chains are fixed for drawing the machine.

F F Two coulter bars, each alike, containing grooves cut horizontally for the reception of bolts and screws, by which the coulters are fastened; and to prevent the wood work being injured by the screws, plates of iron are affixed under the nuts :—

Bolts

Bolts and nuts are also passed through the coulters bars perpendicularly, to prevent the grooves from opening; and through these grooves (which extend the necessary length of the coulters bars) the coulters may be placed at any required distance, from six, seven, eight, nine, ten, to thirty-six inches, or more.

1 2 3 4 Six coulters numbered between the bolt holes; which figures are a government for setting the coulters to the required depth for depositing the grain. For instance, when the bolts are passed through the lowest holes without any numbers, the coulters are on a level with the three wheels; when the bolts are fixed over figure 1, the grain is deposited at one inch; when over 2, at two inches; over 3, at three inches; and over 4, at four inches under the surface of the ground. And accordingly may be made, so as to deposit at any greater depth.

T 4

G Six

G Six cylinders, which occasionally slide off and on the axis, so as the whole or any number of them, may be fixed at any required distance.

The four large cylinders contain two sets of cavities or holes, and grooves, into which the seed boxes are fitted. The small cavities are for the delivery of wheat, barley, St. Foin, or other large seed, and by every revolution of the large wheels, (which are 114 inches in circumference,) about 114 grains of corn are regularly dropped on the same length of land; but the seed may be increased to any required quantity, by means of the sliding regulators, which are instantaneously raised or lowered, and fixed by nuts and screws to the inside of the seed boxes.

The double rows of large cavities are for the purpose of drilling horse beans at three inches, or peas at one inch apart in the
rows;

rows ; also oats, carrots, turnips, or any small feed. When these cavities are to be used, the wheat boxes must be taken off, and another set of boxes, adapted to the cavities of the cylinders, are fastened on, so as to drill at any required distance ; and to the inside of these boxes, are also fixed sliding regulators, which, by being elevated or depressed, increase or decrease the quantity to be sown. Three inches I deem to be the best depth for drilling peas and beans.

H. Seed boxes, which are fastened with three screws in the frame.

I. Conductors, into which the seed is delivered out of the cylinders, and conveyed into the grooves or hollows in the back parts of the coulter, and to such required depth in the ground as the coulter may be set at. These conductors are removeable, they are fastened with screws to a bar at the

the back part of the machine, and supported by bars which extend under them, across the frame.

K. The axis, which passes through the cylinders and large wheels, is supported by brass collars, (that cannot be discovered by this view) which have holes through the upper surface, to drop oil into, and are covered with buttons or sliders to prevent dirt or dust falling into the holes.

A harrow is fixed to the back part of the machine, which, with a marker and travelling wheels, cannot be seen in this view.



FIG. II.

Represents a side view of the machine when at work.

a. Iron

a. Iron ring, with a hook and chain fixed to it.

b. A sliding board, that covers an opening in the case or box, through which the axis and cylinders are taken out.

c. The case or box that contains the inside work, which will equally execute in the most windy, as well as in calm weather.

d. The handles, which are for the purpose only of lifting up the machine at the head lands, and placing it in its proper direction.—When all the boxes are filled with feed, the weight of the machine is not as heavy to lift up, as the weight of a common size loaded wheelbarrow.

e. The marker, which is fastened with a bolt and screw into that part of the frame which contained one of the travelling wheels.—

wheels.—The use of the marker is, to make a furrow in fields which are not ridged, such furrow being a guide for the plowmen working the machine, when the impression of the wheels is not sufficiently discoverable.

f. The harrow, for the purpose of more effectually covering the seed, and making the land even.

g. One of the three coulter on the fore coulters bar.

h. One of the three coulter on the hind coulters bar.

i. The guard, which enters into the groove of the coulters, and protects the pipe of the conductor from being injured by stones, or clogged with dirt or weeds.

k. The

k. The pipe of the conductor, which enters into the cavity in the back part of the coulter.

The machine has two frictions only, viz. one on the gudgeons of the fore wheel, (which any smith can repair or replace) and the other on the axis of the hind wheel, which is supported by strong brass collars. The coulters, are of such a height and distance from each other, as to be capable of working in couchy, stoney, and every kind of soil, except rocky ground. And whatever accident may carelessly happen to the case or wood work, such may be easily repaired by any carpenter. All the principal working machinery is so strong, that nothing but wilful and the greatest violence can possibly injure it. —With care it will last thirty years or more.

The machine can be made to any dimensions, for the garden as well as the field.

field. And the cylinders may be made of either brass, iron, or wood.

A man, boy, and two horses, can drill with this machine, eight acres of stiff, or ten acres of light land in one day ; at the same time effectually cover the seed.



FIG. III.*

Represents a running hoe, for cutting the weeds between the drills, and adding earth to the rows of vegetables. The two points collect the weeds, which are in a manner enclosed, and more effectually destroyed, than when the blade is square or angular.

Hoes, may be easily made on the same plan, of any size, by country smiths. The breadth of about three, or three inches and a half, are best adapted for six-inch intervals,

* Is not the invention of, but altered by the AUTHOR.

vals, and in proportion for rows at greater distances.

The most proper season for hoeing, is, before the ears of corn are formed in the stalks, or when the plants cannot be injured by treading, and when the earth is sufficiently dry, so as to quit the hoe; such an opportunity should by no means be neglected; when, as many careful hands as can be procured, should be set to work. I have particularly observed, that by hoeing between rows at twelve inches distance, the plants are greatly trod on, which do them no injury when young; but when the stalks grow large, the weight of a man bruises the stems, which frequently perish. In light soils, a man can hoe two acres a day, between intervals of twelve inches; and in proportion between nearer rows, and on stiffer soils. Particular care should be taken that the hoers do not cut the young plants.

I must

I must beg leave to refer the reader to p. 250, for the number of grains of corn, &c. contained in a Winchester bushel. As every species vary in size, I have since endeavoured, with the greatest exactness, to ascertain, and I do believe that the medium may be deemed nearly as under, viz.

Cone wheat.—A Winchester bushel contains five hundred and fifty thousand grains.

Barley.—Five hundred and twenty thousand grains.

Poplar peas.—One hundred and ten thousand.

Horse beans.—Thirty-seven thousand.

I have already observed, that the most proper distance for depositing wheat, barley,

ley, and peas, is about one inch apart in the rows, in a good foil; we will now calculate the number of inches contained in drills at a foot distance on an acre of land, which will discover the quantity of grain that should be used in good ground.

A perch, being sixteen feet and a half long, contains one hundred and ninety-eight inches, which multiplied by sixteen rows or drills, at a foot distance for the breadth of sixteen feet and a half, is three thousand one hundred and sixty-eight, which being multiplied by one hundred and sixty, (being the number of square perches in an acre,) discovers to us that drills one foot asunder on a statute acre, measures five hundred and six thousand eight hundred and eighty inches in length, of course takes that number of grains of wheat for seed, which is three pecks and nearly three pints. When drilled at nine inches distance, takes

U

takes about half a pint less than a bushel. When at six inches distance, takes one bushel and three quarters of a peck Winchester measure, or one bushel and four pints of nine gallon measure. But I must again observe, that the quantity of seed sown should be regulated by the richness or poverty of the soil.

In order to cleanse the wheat from smut, and kill any animalcule that may harbour in the grain, use the steep as directed in page 263; particular care must be taken to keep the grain free from stones, dirt, and lime, which in every experiment I have made, I always observed it to be hurtful to vegetation when applied immediately with the seed, which is injured by its corrosive properties destroying part of the oily and vegetative powers of the seed or grain.

Barley, should likewise be steeped the same as wheat, after being well shook in
a sack

a sack by two men, (stumping will bruise it) to be cleared from ailes. Peas, are generally greatly injured by worms and animalcule, they also should be steeped. I must particularly observe, that all sorts of seeds and grain should when drilled be dry, and free from dirt or stones, which may injure the cylinders, or prevent a regular delivery.

When four feet ridges (which are about the breadth of the machine) are intended to be drilled, they must be well harrowed by the horses walking in the furrows, which will draw the earth therein, and thereby prevent the ridges being poached by treading. In this case, a cross-tree bar must be fixed to the fore standards, which have holes to pass bolts through, for the purpose of occasionally fastening on such bar. The coulter must be fastened by the lowest holes, and the fore wheel placed in the third hole from the top,

U 2

which

which will raise the coulters above the level of the hind wheels, which working in the furrows, will deposit the grain sufficiently deep in the ground; and after drilling, plow the furrows about six inches deep, with a double mould board or common plow.

When eight feet ridges are planted, the coulters must be placed at No. 2; two horses are put to go before each other, the hinder one to be led straight by the man walking up one furrow, and returning the other. The eight feet ridges should be harrowed with three harrows fastened together, the horses walking in the furrows, each side of the ridges, to prevent the ground being trod. When the machine is used on lands not ridged, should the impression of the wheels be insufficient to direct the driver, the marker must be fastened in one of the grooves which receives the travelling wheels, and with the same

same bolt and nut. The marker will make a sufficient furrow to observe the last sowed ground.

When the coulter are to be placed at any further distance than six inches, take off the seed boxes, unscrew the two wheels, draw up the sliding board, take out the pins or keys which fasten the iron work of the brass collars, when they can be easily removed by pushing them out of the grooves, then carefully take out the axis with the cylinders, and slide off as many as are necessary.

The cavities, in the large cylinders and broad seed boxes, are for beans, peas, oats, carrot, and other small seeds; when drilled at a foot, four coulters are to be fastened to the hind coulters bar; when at any greater distance, a proportionable number is to be placed on the bar, then fix the conductors to the coulters, and slide on

the same number of cylinders, which place over the center of the conductors, and screw on them their respective seed boxes, that are of the same mark or number as the cylinders they belong to.

When clover is intended to be sowed with barley, as soon as the barley appears above the surface of the ground, sow the clover seed, which bush in, by the horses walking in the furrows.

DIRECTIONS

DIRECTIONS

FOR

DRILLING CARROT SEED.



CARROT feeds, are very light and sticky.

After making numerous experiments, I found the following method to be the best for an acre of land, or in proportion, when drilled at one foot distance between the rows, viz.

Take two bushels of dry loamy earth,
finely sifted, to which add one bushel of
U 4 bran,

bran, and a sufficient quantity of carrot seed cleaned from stalks and well rubbed between the hands, all which thoroughly mix together and drill.

The carrot seed will stick to the bran, which with the earth will be regularly discharged through the large cavities in the cylinders.

DIRECTIONS

DIRECTIONS

FOR

DRILLING TURNIP SEED.

STEEP turnip seed twelve hours in train oil, which strain through a fine sieve, and immediately, thoroughly mix the quantity of seed you would wish to sow to an acre, with three bushels of dry loamy earth, finely sifted; which drill about two inches deep, as soon as possible after the seed has been steeped. When the plants begin to appear upon the surface, sow a small quantity

tity of foot, or the alkaline manure as per page 60, over them. And for further information, see experiments on Turnips, page 243.

N. B. A small quantity of oil will be sufficient for a large quantity of feed, as it may be repeatedly used, till the whole is consumed.

Lucerne, or any other small feed, may be mixed with three bushels of dry sifted earth and drilled. Sand is too ponderous, consequently improper.

Lime, foot, coal, and soapers' ashes, are too corrosive and absorbent to be immediately mixed and drilled with any species of feed or grain.

Seeds that are porous, are benefitted by being steeped in oil, and the oily species are benefitted by alkaline steeps.

When

When the brushes of the sliding regulators touch the cylinders, about one bushel of wheat or barley per acre is discharged through the cavities; and by raising the regulators but a quarter of an inch, the quantity of seed delivered is greatly increased, which any person may immediately discover, and by the least attention soon know how to regulate.

ADVERTISEMENT.

The machine may be seen in the EXCHANGE, or at Mr. HANCOCK'S, Wheelwright, in the Old Market, BRISTOL.

Orders directed to G. WINTER, BRISTOL, will be duly attended to.——Price *Fifteen Pounds.*

“ Any person who shall directly or indirectly make, use, or put in practice the above invention, or any part thereof,
“ or

“ or in any wise counterfeit, resemble, or
“ imitate the same, or shall make or cause
“ to be made any addition thereto, or sub-
“ straction therefrom, without the licence
“ of the said G. WINTER, shall be pro-
secuted as the law directs.”—*Extract*
from the Patent.

Each machine will be numbered and marked with the Patentee's name, and an ample reward will be given to any person (whose name shall be concealed) who will inform the Patentee of any one making or using any of the said machines, who shall not be licensed, nor found to be a real Purchaser.

PROPOSALS

PROPOSALS

TO

THE PUBLIC.

ANY person living within ten miles* of Charlton, in the county of Gloucester, who will properly cultivate a field of any size, and soil of equal quality, worth twenty shillings per acre ; let one part be sowed with wheat or barley, by the common

* Business will not permit my going to a greater distance.

mon mode of broad casting ; the other part drilled with my machine, and once hoed : At harvest, let four square perches of the drilled, and the same quantity of the broad cast be reaped, kept separate, threshed, and immediately measured ; and in proportion to an extra crop of fifteen acres of wheat, or twenty-five acres of barley, produced by drilling with my machine more than is obtained by the common mode of broad cast sowing, with the seed saved, in one season ; on condition of the amount of such difference in produce being paid to me, valuing the wheat at five shillings, or the barley at three shillings per Winchester bushel, I will give the machine to such person ; and if the drilled crop should produce less than the broad cast crop, I will pay the contractor in proportion for that deficiency, so as to make the drilled equal with the broad cast ; and for the completion of such agreement, I
am

am ready to enter into a regular contract with any person, at our joint expence.

To prevent the least suggestion whatever of any kind of evasion, I will endeavour more particularly to explain my proposal, by reducing it to such a certain form as I trust will be perfectly understood : viz.

Drill one acre or more with my machine, sow another acre or more broad cast, with seed of equal quality, on the same day, on land of equal goodness and culture, in the same field, and adjoining to each other; at harvest let four square perches of each be reaped, immediately threshed and measured; the produce of the four square perches of the drilled wheat being three pecks and six pints, amounts (in proportion to one hundred and sixty perches) to thirty-three bushels and three pecks per acre. We will now measure the produce of the four perches of broad cast, which being
three

three pecks, amounts to thirty bushels per acre. Therefore, as one acre of drilled produces thirty-three bushels and three pecks, of course fifteen acres will produce five hundred and six and a quarter bushels; and as one acre of broad cast produces thirty, fifteen acres will produce four hundred and fifty bushels.

The general quantity of seed wheat used for broad casting, being thirty bushels or upwards for fifteen acres, the seed for drilling we will estimate at eighteen and three quarters bushels. Therefore,

The drilled produces	-	506 $\frac{1}{4}$ bushels.
The broad cast	- - -	450
Extra increase by drilling		56 $\frac{1}{4}$
Seed saved by ditto	- -	11 $\frac{1}{4}$
Difference in favor of drilling		<u>67$\frac{1}{2}$</u>

Which

Which valued at five shillings per bushel, amounts to sixteen pounds, seventeen shillings and sixpence, to be then immediately paid to me as a compensation for my machine.—But should the difference in favor of drilling fifteen acres, be only sixty-seven and a half pints instead of as many bushels, or more than sixty-seven and a half bushels, such difference, more or less, whatever it may be, must be paid to me, and the machine becomes alike the property of the contractor. And if the crop produced by broad casting, exceeds the crop produced by drilling, I will then immediately pay to the person contracting, in proportion for such deficiency, after the rate of five shillings per Winchester bushel, so as to make the drilled equal to the broad cast crop. And I will also immediately repay to him his proportion of the contract.

X

Hence,

Hence, I presume that these proposals must appear sufficiently obvious to every discerning, rational, and unprejudiced Agriculturist.

EXPERIMENTS

EXPERIMENTS

ON

MANURES.



IN the month of November, 1777, I planted apple trees; and in order to facilitate their growth, was advised to apply rotten dung and earth well mixed, to their roots, when planted; the result was, the moles soon dug under their roots, which were exposed to the severity of the weather, and by the soil lying hollow with the

X 2

mole's

mole's ruts, the drying winds penetrated and killed many of the trees.

In November, 1778, I planted four cherry trees, of equal size and sort, at the four corners of a bed in my garden adjoining to the kitchen; in the year 1780, two appeared much more luxuriant, and produced much greater quantities of fruit than the others. On examination and enquiry, found that the servants had thrown the wood ashes (from which they had made their lye for washing) and some soap suds round these trees, which had occasioned their superior growth and produce.

I had two Geraniums in the windows of my bed chamber, the one adjoining to my wash-hand stand, I frequently moistened with the soapy water I had washed my hands with, which plant in every respect, far excelled the other, that had only common water applied to it.

I have

I have also applied soap suds, stale urine, and barton drainings, to my wall fruit trees, and in every instance, they far excelled every other manure; exclusive, of their being applied by watering pots at a less expence, and the walks not injured by wheelbarrows.

I have made several other similar experiments with soap suds, urine, &c. which produced similar effects.

In the month of February, 1782, I manured one half of a *Pasture* field with rotten dung, fifteen cart load of thirty bushels each to an acre; the other half was manured with about two hundred bushels of soaper's ashes per acre. In the month of May following, ten oxen that I had feeding in an adjoining ground, broke into the manured field, which had been hayned for mowing; my bailiff informed, me that they had greatly damaged that part manured with

with the soaper's ashes, without injuring the dunged part. Curiosity induced me to investigate the cause, and on the following day, opportunity permitted my going to the field, I opened the gate which led into the hithermost part of the ground, which was manured with the dung ; a few of the oxen which were near the gate entered ; the others soon followed ; I particularly observed that they hurried over the dunged part without eating a blade of grass, but as soon as they came to that part manured with the soapers' ashes, they immediately began eating. This circumstance fully convinced me of the superiority of soapers' ashes to dung ; which I could impute to no other, than the effects of the alkaline salts, correcting the acidity in the soil, by which a much sweeter herbage was produced, of course, more palatable to the cattle.

When

When soapers' ashes could not conveniently be procured, I have experienced a compost of dung, scrapings of a limestone road, and scavenger stuff, about equal parts, turned once, to be an exceeding good and lasting manure for *Pastures*, producing great quantities of clover, and an excellent herbage.

Early crops of peas and beans may be procured in the following manner, viz.

In the month of November, plant peas and beans at the depth of four inches ; when take a quantity of soapers' ashes, or the alkaline manure, mix with it a quantity of train oil, which scatter over the covered drills, and let it be well incorporated with the soil by raking.

In the months of November 1778, and 1779, I made several experiments with manures upon single ridges on *Pasture*
X4 lands,

lands, in order to endeavour to ascertain, the best and most advantageous for a loamy, and a clayey soil,

The result was, that

Lime alone proved rather injurious.

Lime and earth, and lime with clay, freshened for a season, but were of no real benefit.

Coal ashes alone, produced a very small quantity of white clover, without increasing the crop.

Soaper's ashes, [in proportion to a bushel per square perch, had a very visible effect, by increasing the crop and producing great quantities of white clover and sweet herbage.

Dung, produced a coarse luxuriant herbage.

Scavenger

Scavenger stuff, which is a mixture of coal ashes and street dirt, far excelled coal ashes alone, but was inferior to soapers' ashes.

Salt, 4lb. to a square perch, ranked with the unmanured.

In the year 1778, my workmen, in raising stones for building, dug to a very dark blue stratum; it cut like soap, it appeared very fat between the fingers, and at first view had every appearance of being excellent Marle. But in order to ascertain a better knowledge of its real properties, before I applied it as a manure, I analysed it in the following manner:

1st.—Exposed it in the open air, it did not fall into powder.

2d.—In pure rain water, it retained its original state.

3d.—It

3d.—It did not effervesce in, nor blunt the acidity of vinegar.

4th.—Infused in distilled water, in a gentle heat forty-eight hours, and frequently stirred; afterwards it was filtered and a part mixed with, but did not alter the colour of the syrup of violets.

5th.—The above filtered infusion, and solution of fixed vegetable alkali, produced no precipitation; but I perceived something similar to a faint purplish tinge.

6th.—The evaporated infusion did not chrystalize.

7th.—It effervesced with the spirit of nitre.

8th.—It barely appeared to effervesce with vitriolic acid, but gradually fell into a powder.

9th.—The

9th.—The infusion made no alteration in the colour of the infusion of galls.

10th.—It was well worked into a thin cake; burnt in a strong fire; when cold, the colour a pale red; put into water, but did not dissolve or fall asunder.

11th.—Part of the burnt cake powdered, put into water, but conveyed no calcareous taste.

12th.—Dried before the fire, and thrown on fused nitre, very few sparks appeared.

Real Marle, when exposed to the atmosphere, or put into water, falls down into a powder; it effervesces with vinegar and all other acids, which it attracts, blunts, or destroys.

Hence, what at first appeared to me to be good marle, was no other than a clay of a dark

dark blue colour, similar in every other respect whatever, to a yellow coloured clay, which I have since analysed, and found to contain the same properties.—Nevertheless, I was determined to lay about five bushels on an adjoining pasture field, where it this day remains in the same unaltered state as when first laid on. Therefore, I particularly recommend it to every person, to be extremely cautious, how they apply any manure they do not know the properties of.

As I had many stones raised from off this bed of blue clay, about one hundred loads of it were dug out, for the purpose of making a pool for the use of my cattle.

In the month November, 1779, I broke up a small field containing three acres, about one half of it was so sandy and light, that the late occupier could never obtain twelve bushels of wheat per acre, off this part; this induced me to haul about sixty loads

loads of the blue clay to the field ; and for the purpose of dissolving and correcting any metallic or bad particles the clay contained, which time did not then permit me further to investigate, I had ten cart loads of quick lime mixed with it, and spread over the ground. The succeeding crop produced twenty-three and one half bushels of wheat per acre, from land that before had not produced twelve bushels.

Hence, the pernicious properties being destroyed by the lime, the cohesion of the corrected clay added tenacity and fertility to the light soil, which has hitherto retained that adhesion ; and has since produced crops, much superior to the first.

The manures, which I have found most advantageous for arable, stiff loams, and clayey soils, are quick lime, coal, and soapers' ashes ; these lighten, absorb, and correct acidities, dissolve metallic particles and earthly salts, that, are thereby converted in-

to

to neutral salts ; which, in conjunction with the oily particles in the earth, are rendered miscible with water, and become the food of plants.

The operations of manures upon different soils, are to be accounted for, from their known properties, ascertained by repeated experiments. Hence, every Agriculturist ought to study and know the qualities of different soils, as well as manures, that they may be properly applied to each other. This science I deem to be one of the most useful of all human arts ; is similar to a physician's knowing the cause of diseases, the properties of medicines, and their most effectual applications.

And, in order that the Agriculturist may be enabled to obtain a greater knowledge of the properties of different soils and manures, will now proceed to their analysis, so far as is necessary, and really useful for farmers.

T E

THE
APPLICATION
OF
CERTAIN SUBSTANCES
TO ANALYZE
SOILS AND MANURES.

1st.—**D**ISTILL a sufficient quantity of water, or use pure rain water, which has been received in the open air, at a distance from smoke or dust; in which infuse the earth forty-eight hours in a gentle heat, stirring it often; when cold, and the earth has subsided, filter the water, which

which will retain the taste of any metallic or earthy salt.—Or

2d.—Drop into the above filtrated infusion, the solution of fixed vegetable alkali, if there be any metallic or earthy salt, it will precipitate.

3d.—Evaporate the infusion, if it contains any neutral salt, it will crystalize.

4th.—To the filtrated infusion apply an infusion of galls, if there be any earthy or metallic salt; the colour will be red if alum or copper; a deep purple if iron.

5th. To the filtrated infusion apply the syrup of violets; if it turns red, the soil contains an acid; if green, an absorbent earth.

✚ All acid bodied effervesce violently when mixed with alkaline substances, and turn a blue

a blue tincture of violets red ; whereas alkaline substances mixed with the same tincture, turn it green.

6th.—Clay, or earth, containing calcareous earth, put into vinegar, will effervesce and blunt or destroy the acidity, in proportion to the quantity of calcareous earth contained therein.

7th.—Red and blackish soils, frequently contain iron or other metallic particles, which may be visibly discovered by a microscope, and may be perceived to glitter, by being exposed to the sun's rays.

✂ All metallic and earthy salts, are poisonous to vegetation, which with acids, are decomposed by quick lime, alkaline manures and good tillage.

8th.—Clay and earths, dried and powdered, thrown on fused nitre ; if a few
Y sparks

sparks are produced it contains a small quantity of oil, and according to the increase of deflagration and detonation, so in proportion is the richness of the land.

9th.—Dry and powder rotten dung, throw it on fused nitre, its detonation and deflagration will be very great.

☞ Nitre will melt in the fire and grow red hot; is not inflammable of itself, but when oil, or any substance containing oily particles, is added to it, it will detonate and deflagrate, in proportion to the quantity of oil contained therein.

10th.—Analysis of marle, see p. 331.

11th.—Quick lime yields neither salt nor oil by distillation, but when mixed with the soil, it strongly attracts moisture, saline, and oily substances, which with metallic particles

particles and acids, are decomposed and dissolved by lime.

12th.—Chalk fresh dug, yields neither oil nor salt by distillation, but when mixed with the soil, attracts oils and salts; effervesces with, and absorbs acids.

13th.—Pit coal ashes by distillation or infusion, yields neither oil nor salt, but attracts moisture, absorbs acidities, greatly lightens and adds friability to stiff cold soils under tillage.

14th.—Wood and all other vegetable ashes, boiled or infused in water, yield a fixed alkaline salt by evaporation.

15th.—Urine, yields oils and salts by distillation and sublimation.

16th.—In order that I might be enabled to form some idea of the effects of the at-

mospherical influences on soils, in the month of October, 1782, I pared the turf from a very poor loamy earth, dug up about three quarts, which was divided equally into three flat pans. I dug up a pint more, which was immediately put into a glass retort, and distilled in a small portable furnace, with a gentle heat for near two hours, I got a quarter of a pint of water, which had a kind of acid sulphureous taste. I gradually increased the heat, and in two hours more got about twenty drops of a yellowish oily liquor; but unfortunately broke the retort, which at that time put a stop to my further process by distillation. As part of the retort and the earth remained in the furnace; I increased the heat to the highest degree I could, and when the fire was extinguished, I found the earth was vitrified. This made me conclude that the soil contained some salt, as salt is one of the principal assistants of vitrification.

17th—I

17th.—I put a tea spoonful of the dried and pounded earth on the fused nitre; it produced a few sparks, which were the effects of oily particles.

18th.—The three pans were placed in different situations.—No. 1 was carried into a closet excluded from the air.—No. 2 was placed in an open situation, so as to be exposed to the sun the whole day.—No. 3 was placed near a wall with a north east aspect, where it only received the benefit of the morning sun till ten o'clock. The mould in each pan was carefully turned with a trowel six times in twelve months, when I took a tea spoonful out of each pan; the earth was dried, pulverised, and throwed on fused nitre.—No. 1 produced nearly the same quantity of sparks as when first dug.—No. 2 produced twice as many, with a feeble detonation.—No. 3 detonated and deflagrated twice as strong as No. 2. Hence, I conclude from these experi-

ments, that No. 1 being excluded from the atmosphere, received no benefit.— That the atmospherical influences imbibed by No. 2, were exhaled by the rays of the sun, which operated on it the whole day.— That No. 3 being shaded the greatest part of the day from the sun, it more effectually retained the atmospherical influences which it had imbibed, than No. 2, which was exposed to the sun.

Hence, I presume and am fully convinced, that all tilled lands are greatly benefited by the effects of air, rain, dew, and frost; and that the more the ground is shaded by the crops thereon, the less the exhalation, of course the more the moisture and oily particles are retained therein, and the greater is the putrid fermentation, particularly arising from esculent plants.

 All these experiments were made for my private use only, therefore were not
so

so minutely investigated as they should have been for public inspection.

The best lands are generally reserved for pastures, and the thinnest poorest soils tilled; which, from observations and experience, I deem in many instances, to be erroneous.

Rich lands are cultivated at a less expence than poor lands, which require more manure, feed, and oftentimes more tillage. If the Agriculturist will justly calculate, and impartially compare the expence and produce, he will find it more to his advantage to pay thirty shillings for land that will produce him thirty bushels of wheat per acre, than to cultivate land worth ten shillings, rent free, that will produce only fifteen bushels per acre, which is deemed a good crop from thin poor soils. Where the ground is free from springs, stoney or rocky, such soils may be more advantageously adapted to grasses, particularly St.

Foin, which will continue in the land from fourteen to twenty years; and it must be a very poor soil indeed that will not produce a ton per acre.

I must also observe, that very rich ground is improper for corn, because its effects are similar to an over manured soil, which makes the plants grow so luxuriant, as to run more to leaves and stalks than to seed, and much more liable to be beat down by tempestuous weather.

I will venture to assert, that the lands in this kingdom now under tillage, may, by thorough culture, proper management, and drilling, be made to produce at least one fourth part more than they do at present.

Experiments in Agriculture are made with little trouble and expence: Inclination, and a strict attention to their effects, are the principal requisites.

As

As the qualities of all soils vary considerably, every Agriculturist ought to make himself well acquainted with the nature of his land, as also the properties of manures; a judicious application of which, with a proper course of crops, and thorough tillage, *are the chief and grand Secrets of Agriculture.*

THE

THE
FOLLOWING EXPERIMENTS

Were ascertained by the Author, since his
first Publication.

THE CAUSE AND CURE
OF A
DISEASE IN SHEEP,
CALLED
THE ROT.

SHEEP, that are fed on hills, and on
lands that do not retain moisture, are
not subject to that disease, commonly cal-
led

led the rot ; the air in such situations, is free from impurities, salubrious and vivifying.

Low, and marshy lands, contain corrupted, stagnated waters, which emit putrid effluvias, that engender numerous animalcule, which float in the atmosphere. — Heavy storms of rain beat down those animalcule,* which deposit their eggs on the grass, and therewith are conveyed into the stomach and intestines, from whence they are carried into the lacteal vessels ; but, when they arrive at the capillary vessels of
the

* My late worthy neighbour, JOHN HARMER, Esq: of Penpark, now deceased, (who resided many years in Virginia, and whose veracity was never doubted) informed me, that after heavy storms of rain, young frogs, just able to crawl, were frequently discovered on the leaded part of the roof of his house and pavements ; which I conceive were with the watry particles of marshy and boggy soils, exhaled by the heat of the sun, and floated in the atmosphere, till forced down by the rainy torrents ; and what may appear very extraordinary, is, that in less than an hour, they all disappeared.

the liver, these vessels are too minute to admit a passage for the impregnated ova, which is converted into an animalcule, resembling a flat fish, called a flook, that feeds upon the liver, and kills the sheep.

From the numerous experiments I have made, the following recipe is the most effectual for the cure : viz.

Gentian root, thinly sliced,	} <i>An equal quantity of each,</i>
Tops of lesser Centaury, dried,	
Tops of green broom,	
	<i>4 ounces.</i>
Green rue,.....	<i>1 ounce.</i>
Salt of wormwood,.....	<i>1 ounce.</i>
Spring Water,....	<i>2 gallons.</i>

Boil gently one hour, in a kettle with a cover.*

As soon as the least symptom of the disease is discovered, the sheep should be housed every night, and on the following mornings, (the stomach then being most empty)

* A cover to the kettle will prevent the liquor and spirit therein contained, from being evaporated.

empty) about three common wine glaſs fulls of the above decoction ſhould be given to each ſheep, obſerving to keep them in the houſe half an hour after, to prevent their feed counteracting the effects of the decoction.

EXPERIMENTS

EXPERIMENTS MADE ON WHEAT,

FOR THE PURPOSE OF

Endeavouring to find out the Cause of Smut,

AND A

REMEDY TO PREVENT IT.



I again must observe, that barley, wheat, peas, beans, and oats, are protected by an oily skin ; that their being steeped in oil, tends to harden them, and prevents their vegetating.

The

The following experiments were made the second week in October, 1786, in a field, a hazle coloured loam, about 6 inches deep, on a stone brash clay, after a crop of early turnips, part of which crop was used at home, the remainder was sent to the Bristol market.

Part of the seed wheat was not threshed, but the binding parts of the sheaves were beaten upon a pole, by which means the seed was not bruised, and none but the plumpest grains dropt out of the ears. The seed wheat that was threshed, was steeped in a strong brine of salt and water, after, mixed with lime, which is the general method used in Gloucestershire. The threshed wheat was sowed on a ridge, eight feet wide, marked with a stake.

No.

1. Manured with rotten dung, in proportion to 20 cart loads per acre.

2. Manured

2. Manured with quick lime, half a bushel per perch, as soon as flaked, was plowed in.
3. Manured with soapers' ashes, 1 bushel per perch.

All the remaining ridges were not manured, but drilled with grain, that was not threshed, but beaten out of the ears, by striking the binding part of the sheaves upon a pole, and steeped six hours, in the several preparations, as follows :

No.

4. Steeped 6 hours in barton draining.
5. Steeped 6 hours in stale human urine.
6. Boiling water, poured on pidgeon's dung.
7. Boiling water, on quick lime.
8. 1lb.

8. 1lb. of salt petre, dissolved in 4 gallons of boiling water.
9. 1lb. of bay salt, dissolved in 4 gallons of boiling water.
10. 1lb. of barilla, infused in 4 gallons of boiling water.
11. 1lb. of kelp, infused in 4 gallons of boiling water.
12. 1lb. common salt dissolved in 4 gallons of boiling water.
13. $\frac{1}{2}$ lb. common salt, dissolved, and $\frac{1}{2}$ lb. of stone lime flaked in 4 gallons of boiling water.
14. Wheat threshed and drilled, without being steeped.

The above experiments No. 4 to 14 inclusive, were all drilled at the distance of
Z 6 inches

6 inches between the rows. The ingredients infused, were well stirred 4 times in 48 hours, for the purpose of more effectually extracting their salts. When the lye was fine, it was drawn off into tubs and buckets; the seed was steeped therein 6 hours, stirred, and all the grains that floated on the surface, were skimmed off. The found seed, that sunk to the bottom of the tubs, was taken out, spread thin on the granary floor, with the windows opened, and thereby, was sufficiently dry for drilling, in three hours.

I made use of rain water for every experiment, as being a more proper menstruum for separating component parts, than spring water; which in general is very hard, as being saturated with the particles of that stratum, of iron ore, lead ore, or &c. that it passes through: hence, it should be cleansed from these heterogeneous particles, by distillation, which will properly purify it.

My

My drilled crops were twice hoed, and at harvest, in a clean state. My broad cast crops were once weeded as clean as possible. In six weeks after, the ridge No. 1, manured with dung, contained numberless young thistles, which could not be cut, without doing great injury to the crop, which was then grown very high. The ridge No. 2, manured with lime, was as free from weeds, as land could well be. A great quantity of chick weed, grew on the ridge No. 3, which was manured with soapers' ashes.

About a week before the crops were cut, the different experiments were minutely examined. The ridge No. 1, was full of weeds, and a great quantity of smutty wheat; the straw was very luxuriant, but the ears not large in proportion. The ridges No. 2, and 3, produced but a few smutty ears; the straw, not so large or high, but the ears were larger than ridge No. 1. The following ridges, are laid down in

Z 2

rotation

rotation, according to their luxuriancy, fertility, &c. No. 11, steeped in solution of kelp, was free from weeds, the straw very large and strong; upwards of six feet high, supporting ears that produced from ninety to one hundred and twenty grains each, and free from smut. No. 10, steeped in solution of Barilla, rank next; free from smut. No. 6, steeped in infusion of pigeons dung, nearly as good. All the other ridges were not equal to the above; but free from smut. It was originally my intention, to have kept each experiment separate, for ascertaining the different produce, which I would have done, had not a neighbouring farmers' flock of turkies, about thirty in number, marauded twice on my wheat, and committed great depredations.

On examination of the smutty ears, I found a few that contained four or five grains that appeared perfect, the others, blighted and black; I pulled the plants out
of

of the ground, and in almost every one, I discovered in the root, a small worm, which appeared to have destroyed part thereof. Hence, I conceive that the seed must have been bruised in the threshing, or winnowing, by which it became diseased; that in the months of May and June, when the heat of the sun was sufficiently powerful to convert the eggs of animalcule, carried in the dung, into an insect, which feeds on the root of the weak and diseased plants, and in proportion to the quantity of the roots destroyed, so are the plants and ears affected; for, it is the root that conveys the most nourishment to wheat, oats, and barley; and when part of that root is destroyed, so in proportion, is the plant deprived of a proper quantity of food, to make it strong, healthy and fertile. The pores of the plant, not being supplied with sufficient nutriment or sap, a few cold nights repel that sap, contract the pores, which prevents the ears being nourished, of course they putrify, and become black.

As a proof that trees and vegetables are chiefly nourished by their roots, in cold climates, I will adduce the following circumstance: in the year 1790, I had occasion to procure the rind of the root of a fruit tree, for a particular medical purpose. The tree, was in a most luxuriant state, and had bore a most plentiful crop of fruit, the preceding year. To obtain this bark in its greatest perfection, it was procured at the time when the tree began to blossom. The roots, on one side, were cut off, as near to the trunk as possible. The tree, did not bear half a crop that year: in the year 1791, one half of the branches were withered, and the other part bore but a very scanty crop; which could arise from no other cause, than the loss of part of its roots, that before were enabled to search for, or attract food, for the nourishment of the tree. Similar to this, I deem to be the cause of the smut in wheat.

In

In warm climates, where there is no rain during the summer season ; there trees and vegetables are almost entirely nourished by their leaves. The sun exhales sufficient moisture from the watry elements, which float in the atmosphere ; at night is condensed, falls in the form of dew, on the leaves, which their porosity imbibe, and is conveyed through the most minute passages to nourish even the roots.

Having pointed out from experience and the greatest attention, what I deem to be the cause of the smut in wheat ; to prevent all perplexities that may arise, from the numerous experiments I have made, for the improvement of Agriculture ; I will endeavor, in the most explicit manner I can, to advise the farmer, how to prevent and cure his crops of wheat, and barley, being affected with the smut.

Manure, as much as may be agreeable, for potatoes, turnips, beans, cabbages, and

carrots ; these being hoeing crops, the seeds of the weeds carried in the dung, will vegetate, and by hoeing be destroyed.

Manure clover, as soon as convenient after the barley is cut, it will nourish and keep the roots warm in winter ; the extra crop, will most amply repay the expences of manuring. The seeds carried with the dung, will vegetate, and the weeds will be destroyed, before their seeds can ripen.

To manure for peas, and vetches intended for seed, on rich land, is injurious ; the manure increases the haulm, but not the pods.

Potatoes, turnips, beans, cabbages, and carrots, are meliorating crops ; that is, the land is enriched, by the manure laid thereon, and by hoeing, which destroys the weeds. Clover is a meliorating crop, for its roots is converted into mucilage,
by

by which the land is enriched. Peas, and vetches, are meliorating crops, they enrich the land by their leaves and haulm, preventing the sun, from exhaling the nutritious particles from the earth, whereby a constant fermentation loosens, and improves the soil. Wheat, barley, oats, flax, and rye, are exhausting crops, that is, they are great impoverishers of the soil, and should not be sown two years successively. It too frequently happens, that farmers, endeavouring to make the most they can of their farms, will sow two successive crops of wheat, the third year sometimes oats, or barley; such management, I will with the greatest confidence pronounce to be extremely erroneous indeed! I will admit that the farmer may gain by the first, perhaps by the second, but by such cropping, the land will become so impoverished, that it will require some time to recruit it properly. Hence, the farmer ultimately loses, instead of gaining money. Exhausting crops should always
be

be succeeded by ameliorating crops, for the food consumed by the exhausting crop, is in a great measure recruited by the ameliorating crop.

As a further illustration, to point out the best and most profitable method of cultivation, suppose the farm to consist of a good loamy soil, pasture land, that had not been tilled for many years; to proceed regularly, and most profitably, the grass should be eaten off as bare as possible, by the beginning of October; the sward plowed and laid as flat as possible; immediately after it should be very well rolled, with a heavy stone roller, for the purpose of closing the sward, to make it rot as soon as possible. Fallowing, is the loss of a years rent, exclusive of the loss of profit arising from the crop. Vegetation generally ceases about the beginning of October, when there is sufficient heat and moisture which promote putrefaction, and make the sward rot
the

the sooner. Grass, being eaten off as bare as possible and left in that state, the land remains unprofitable, untill vegetation commences in the spring. In about a fortnight after the field is plowed, it should be lightly harrowed, not across, but length ways the ridges, to prevent the sward being tore up, and to open the surface, for the freer admission of rain. About the beginning of December, the land should be plowed, as deep as possible across the ridges, or obliquely, as must appear best, for carrying off the wet, and in this rough state, it is to remain during the winter, when the frost will penetrate the clods, which will be pulverised by the first thaw, and thereby enabled to receive, other atmospherical influences. As soon as the weather will permit, heavy ox drags should be used, for more effectually pulverising the soil. When conveniency will permit, the stone roller should once more be used, to break those clods, not already broken, and, for the purpose

purpose of making the ground even, which will enable the ploughman to effect his work the better, which, when done, if peas, are drilled at twelve or more inches, according to the sort required, they can be easily hand hoed, which would be, a very great advantage. If not drilled, sowing broad cast and plowed in, is the next best method. I totally disapprove of sowing any kind of pulse or grain broad cast and harrowed in, as great quantities of the seed remain uncovered, or so shallow, that storms of rain wash off the earth, and leaves the seed exposed to the birds.

After the peas are harvested and carried off, the land should be immediately plowed and harrowed, to collect the remaining short haulm, left after cutting, with their roots into piles, where they are to be burnt, and the ashes, scattered over the ground; another plowing should be given to form the ridges for drilling, &c. The fresh broke up land,
the

the winter's fallow, and the meliorating crop of peas, will enrich it more, keep the land, cleaner from weeds, and produce a much more fruitful crop of grain, and freer from smut, than land manured with soil. The land thus prepared, being brought into good tilth ; not with a summer's fallow, at the expence of a years rent, taxes, plowings, &c. but by breaking up and pulverising the land at a season entirely unprofitable to the farmer. When vegetation commences, his crops of peas will also vegetate, and by this mode, will produce a plenteous harvest, with a very considerable gain instead of loss.

We will now draw a comparative view, between the common method, too frequently made use of in many countries, and the mode here described ; which real experience and practice enables me to point out.

The common practice of breaking up land is generally in November, or beginning
of

of December, that being a leisure time with farmers.

Expences per acre, at the most moderate computation, and produce, viz.—Plowman, driver, four horses, wear and tear of gear, per day eight shillings.—

	£.	s.	d.
One day and a quarter breaking up an acre of pasture land,	0	10	0
May or beginning of June, second plowing, sward not sufficiently rolled,			
Sept. 80 bushels of lime, at 3d.	1	0	0
Halling & spreading ditto when slacked	0	10	0
Halling and spreading 20 cart loads of dung, at least.	0	15	0
3d. Plowing.			
Rent 20s.—Tythe 1s. 6d.	1	1	6
	4	14	6

PRODUCE.

Sheep fed on the grass growing be- tween the rows of the unrolled half rotten turf.	}	0	4	6
		4	10	0

A real loss per acre, exclusive of the dung raised on the farm, and which might have been much more advantageously used for fallow crops, or pastures.



Expences and produce of land, not Summer fallowed.

	£.	s.	d.
1st. Plowing, 2d. October, per acre:	0	10	0
Rolling, to close the fward, 2d. Oct.....	0	2	0
Light harrowing, to admit rain, 15th Oct.	0	2	0
Cross, or oblique plowing ditto, 5th Dec.	0	10	0
Harrowing with ox drags, 28th Feb.....	0	3	0
Rolling, to break small clods, March.....	0	2	0
Plowing, land being pulverized and lightened	0	8	0
4 bushels of peas for seed, at 4s. 6d.....	0	18	0
Drilling at 12 inch intervals.	0	2	0
Twice hoeing, with a hand hoe.	0	1	6
The haulm, will be more than adequate } to allow for harvesting and stacking. }			
Thrashing and winnowing 28 bushels, } at 6d.	0	14	0
Carrying to market and expences.	0	5	0
Rent 20s.—Tythe 3s.....	1	3	0
	5	0	6

	£.	s.	d.
Produce 28 bushels, at 4s. 6d.	6	6	0
Expences as above.	5	0	6
Clear profit per acre,	1	5	6

Exclusive, of gleanings for pigs, in the field, at the barn door, and the land left in a cleaner and better condition for wheat or &c. than that summer fallowed and manured.

	£.	s.	d.
By the above system, there is a gain of	1	5	6
By the Summers' fallow, a real loss of	4	10	0
Total loss by Summer fallowing per acre.	5	15	6

After peas, the next most profitable crop of grain is wheat.—The largest and plumpest grains are the best; to procure which, from being bruised by threshing or winnowing, a large bench should be carried into the barn; the operator must take off his shoes, strike the binded part of the sheaves three or four times against the edge of the bench; the

the best and heaviest grains will drop out ; the sheaves must be laid aside, for the remaining grain to be threshed out. The operator can, by this easy method, procure many bushels of the best seed in a day ; which, must be also winnowed, with the operators shoes taken off. Having thus procured the seed free from bruises, the next process is, to destroy animalcule, so minute as to be invisible to the naked eye, which may injure its stamina ; for which purpose, as experiment No. 11, p. 353 produced the best crop, free from smut, the agriculturist is requested, for his own benefit, particularly to attend to it, viz.

Procure two tubs, that will contain about 70 gallons each, (a large wine pipe sawed in two, was what I made use of) place them on a bench sufficiently high, so as to admit of a pail being put under to draw off the infusion, fix in it a cock, about 3 inches above the chine, and on the inside

A a place

place a huckmuck, such as is used for brewing, to prevent the malt from clogging the cock; get 17 or 18 pounds of kelp* which small quantity, may be purchased at any glass-house, for about ninepence or less; let it be pounded as small as possible, thrown into the tub, and covered with about 50 gallons of rain or river water; it should remain in the tub 48 hours, and well stirred twice a day, that the fixed alkaline salts therein contained, may be the better dissolved and incorporated with the water. The other tub must also be furnished with a huckmuck and cock, and at the expiration of about 48 hours, the prepared lye must be drawn off into the tub; put therein the seed wheat, skim off what floats upon top, let the remainder be steeped for

* Kelp, is procured by burning sea weeds, called kali (*glass wort*, in botany, a genus of the *pentandria-digynia* class of plants) when dry, it is burnt in pits dug in the ground. By this method, the weeds are not only reduced to ashes, but converted into a kind of hard stone, of a blueish grey colour, which is the best, and is forced to be broken with hammers to get it out of the pits.

for six hours. In the interim, let the first tub be cleansed, and after the steeping of the seed, the lye must be drawn off into it, for the purpose of steeping more seed; which, when steeped, let it be thinly spread in the granary where it will soon dry, for drilling or sowing, provided the windows and doors are left open. *This steep, with my method of farming are the most effectual remedies I have experienced, for the cure and prevention of the smut in wheat and barley.* This steep, not only promotes the fertility of wheat and barley, but also peas, beans, oats, and every other species of seed, *covered with an oily skin.*

After the crop of wheat is carried off the land, the stubble must be plowed in, as soon as conveniency will permit, and remain in a rough state during the winter season. The stubble will keep the earth hollow, which will be enriched with the atmospherical influences, of frost, snow, &c. The succeeding crop after the wheat,

must be meliorating,—either vetches or peas, as may best suit the farmer. If vetches, when not intended for seed, the most profitable method of applying them is, to cut them as wanted, and fodder horses in the stable, or cattle in the fold. The great advantage arising therefrom, will be the increase of dung; and after the field is cut, the second crop will produce good feed for sheep and lambs, and the land will be left in excellent condition for another crop of wheat, which will be the fourth crop without manure. After the wheat, another meliorating crop should succeed. The wheat stubble should, (as I have before mentioned) be plowed in as soon as conveniency will permit. If the land is dry, free from springs, the loam rather sandy, potatoes, is the most profitable crop, I call them meliorating crops, because, they must be manured for, as much as possible; by hoeing, the weeds carried with the dung, will be destroyed; the dung will be thoroughly incorporated

incorporated with the soil, and the land will be left in excellent condition for a crop of wheat, (*the farmers' sheet anchor*) which, in every instance, I have experienced to be much more productive, than when managed in any other manner. My numerous and different experiments, instructed me, that the best method for planting potatoes was, to make furrows about six or seven inches deep with the plow, at the distance of about twenty inches, and to drop the cuttings containing two or three eyes, about nine inches apart in the furrows; by this method, the potatoes, were not only more sizeable for the market, but also the crop more productive. But, should the farmer find it more convenient, to raise turnips, they also, must be as highly manured for as possible, and by proper hoeing, the weeds will be destroyed, and the manure incorporated with the soil. The feeding of sheep on the turnips, will also greatly assist to enrich the land. Steeping the

turnip seed in train oil, agreeable to my experiments in page 243, will greatly strengthen the plant, and is the most effectual to prevent the depredations of the fly. Barley and clover, of course succeed the turnips, then follows wheat on the clover lay. By this, or such like management, of taking alternately, meliorating, after exhausting crops, the same land may be kept under cultivation for a thousand years, and the last crops will be better than the first; because, the land will be in a higher state of pulverization, than when the first crops were taken off. I deem cabbages, carrots, and beans, to be meliorating crops, for the same reason as potatoes and turnips.

A SAFE

A

SAFE AND SURE RECIPE,

WHEREBY

GENTLEMEN WHO FARM THEIR OWN ESTATES,

MAY

INCREASE THEIR FORTUNES RAPIDLY.



A GENTLEMAN, possessed of a large estate on which he lived, found, that instead of getting, he was losing money. As he was conscious of not being extravagant in any respect, he cou'd not conceive the cause. His Bailiff had been so well recommended for honesty, sobriety, knowledge of farming, and assiduity in his business, as to attract the confidence of the gentleman, who left the management of his estate, entirely to him. One day, when walking in his fields, he met a neighbour-

ing farmer; in the course of conversation, the gentleman said, "I have observed, that yourself and family are always very decently dressed, that you give your children a good education; from whence I suppose, that you must be getting money apace, at which I am surprised; as you pay a great rent for your farm; whereas I, who pay no rent for mine, am losing money; pray farmer, from whence can arise this difference?"

"Ah! my good sir," replied the farmer, "I can inform you whence this difference does arise, and prescribe a remedy, but I do not expect that you will follow my advice."

The gentleman said "I most certainly will, if it is in my power."—"Then sir," says

the farmer, "you have it in your power to follow my instructions, which I will engage shall be attended with success, provided, you will faithfully promise to act accordingly." The gentleman did accordingly promise.

"Then" says the farmer, "do you recollect that in such a field, at the furthest part of your estate, there is a spring of
excellent

excellent water, extremely cold in summer, but in winter appears warm, and emits steam." "I do recollect it perfectly well" says the gentlemen.—"Then sir" says the farmer, "If you will every morning at four o'clock go to that spring in summer, and at six or seven o'clock in winter, and wash your eyes with that water, I am certain that you will soon increase your fortune." The gentleman was extremely surprized to be informed that by washing his eyes he should soon increase his fortune; however as he had promised to follow the instructions, did set off the next morning at the time mentioned: In the third field from his mansion, he observed some strange cattle, feeding on his grafs, which was hained for mowing; in a few fields farther, were strange horses eating his clover; in the next field, his neighbours sheep were feeding on his wheat; which, with the horses and cattle he turned out, and secured the gates, *that had been wilfully opened.*—The real intention of washing
ing

ing his eyes, now appeared too clear to require any further explanation. When the gentleman returned to his mansion, *on strict enquiry*, he found, that his bailiff never got out of bed till six o'clock in summer, and seven or eight o'clock in winter, and very frequently then, did not go round the estate, although a horse was kept merely for that purpose.—*The bailiff was immediately dismissed.*

The next bailiff employed, the gentleman contracted with him, that he should in summer set off at or before four o'clock in the morning; in winter, at or before six o'clock, to examine and see, that no depredations were committed by his neighbours cattle, &c. that he should be very attentive to examine and see, every night, that the farming horses or oxen, or both, should have their proper feed, and be well taken care of; that they should not be forced to hale or draw heavier loads than their strength would admit of; that they should not by any means be beat or ill-treated;

treated ; for the brute, no more than the human specie, cannot brook ill-treatment,—but by mild and soothing usage, the brute creation can be tamed, and will work, so far as their strength can bear, much more by good, than bad treatment ; and that every driver, acting contrary to those directions, should be immediately dismissed ; that once a fortnight, *or not exceeding once a month*, the horses, oxen, and young cattle should be drenched *with one pint of that decoction, prescribed for the cure of the rot in sheep, page 348, and used in the same manner* ; such decoction, being for the purpose of strengthening the stomach, killing the botts in the horses or cattles intestines, prevent the staggers, and to keep the horses, &c. in a healthy state ; that the waggons, carts, gear, and all other farming utensils, should be kept as much as possible under cover, to prevent being injured by the weather ; that all work contracted for, (*contracts being most advantageous for, not only gentlemen, but also*

also farmers,) should be minutely examined, and executed conformable to agreement; that of threshing most particularly, which too often is greatly slighted, and much grain thereby lost; that care be taken, to see that threshers did not carry off grain in their pockets, &c. that at harvest the labourers should cut the grass and corn, low and clean; with many other necessary directions.—The gentleman, at hay harvest, and at other times, privately kept an account of his hay-makers and day labourers work, as a check upon his bailiff's account; his hay and corn were cut by the acre, his hedges and ditches were repaired by the perch, and all work that could be, was executed by the job; he attended every saturday night, to see that the labourers were regularly paid their wages; he kept an account of his disbursements, as also the produce of his estate; he superintended his bailiff's conduct as much as possible, to see that *his directions* were properly executed; he also with that most
excellent

excellent water which his well produced, regularly washed his eyes, at four o'clock in the morning, in summer, and at six or seven o'clock in winter, four times a week, *but not on any particular fixed days which the bailiff might be apprised of.* By adhering strictly to this recipe, the work on the estate was properly executed; the gentleman increased his riches very rapidly, and gave genteel fortunes to his younger children; he obliged his eldest son to attend minutely to the father's management, which the son put into execution, and was alike successful as the father; who by a gentle, a gentle, a gentle decay of nature; at a very venerable old age, was translated out of this troublesome mortal state, into a region of eternal felicity, which continues for ever and ever; and his loss to the community was extremely regretted by all who knew him: Hence, *as an antient author said:*

“ Early to bed, early to rise,

“ Makes a man healthy, wealthy, & wise.”

F I N I S.

ERRATA.

The reader is respectfully requested, to correct
the following errors with his pen:

Page 21—line 12—read, in search.

Page 348—line 12—green rue, read 4 ounces.

I N D E X.

A

<i>ACCOUNTS</i> , regular, the advantages of	8
<i>Advertisement</i> , the Author's,	318
<i>Agriculture</i> , on	1
improvements, who made by,	6
pleasures of,	7
<i>Air</i> , effects of, on vegetation,	86
putrid and noxious, first discovered by <i>Dr. Hunter</i> ,	90
found in every portion of earth,	93
<i>Dr. Priestly's</i> experiments on	93
<i>Alkaline</i> , or new manure,	63
steep, how prepared,	266
recommended for barley and peas,	310
<i>Analysis</i> of soils and manures,	339
<i>Ant-hills</i> ,	53
<i>Ashes</i> , coal	39
soapers', excellent manures,	39
when improperly applied is injurious,	42
wood,	43
<i>Author's</i> reason for publishing,	4

B

<i>Barley</i> , experiments on	254
<i>Dr. Hunter's</i> experiments on	184
———— comparative view of ditto,	186
<i>Barley</i> ,	

<i>Barley, Sir John Anstruther's experiments on</i>	201
<i>Mr. Whitmore's,</i>	204
<i>Mr. Miller's,</i>	207
<i>M. De Chateau-Vieux's</i>	191
number of grains in a bushel,	307
meal, why it should be boiled for hogs,	228
<i>Barton draining, a good manure,</i>	59
<i>Beans, a good fallow crop,</i>	153
number of, in a bushel,	307
when most liable to blights,	153
<i>Blights accounted for</i>	75
best preservative against	76
<i>Bones,</i>	57
<i>Brick and lime rubbish,</i>	49

C

<i>Calculations of produce, how made,</i>	11
100 acres of wheat and 100 acres of barley,	167
15 acres of wheat and 15 acres of barley,	169
<i>Carrot seed, directions to drill</i>	314
<i>Carrots, experiments on</i>	288
<i>Certificate of the author's crops,</i>	289
<i>Chalk,</i>	48
<i>Charcoal dust, hurtful to vegetation,</i>	105
expences of burning,	105
<i>Chemistry explained,</i>	17
<i>Clay soil,</i>	20
analysed,	332
adds tenacity to sandy soils,	335
injurious to pastures,	335
<i>Clouds,</i>	

INDEX.

385

<i>Clouds,</i>	79
<i>Comparative experiments on drilled and broadcast wheat,</i>	276
<i>Composts, how best made,</i>	35
when best applied to pastures,	38
of quick lime and dung, exploded,	31
of lime and ant-hills, how best managed, ...	103
of lime and earth, or clay,	104
of pit coal ashes, or lime exploded,	105
<i>Conversation, remarkable</i>	167
<i>Cold, effects of on vegetation,</i>	72
<i>Cordwood, how best applied,</i>	101
<i>Crops, scanty, occasioned by,</i>	13

D.

<i>Dead animals,</i>	55
<i>Dew,</i>	77
<i>Delu's experiment on plowing,</i>	116
<i>Distance for drilling, the most advantageous,</i>	258
<i>Draining wet lands, advantages of,</i>	94
<i>Drilling, great advantages resulting therefrom,</i>	158
<i>Dr. Hunter's observations and experiments,</i> ..	172
<i>Sir John Anstruther's</i>	198
<i>Mr. Whitmore's</i>	201
<i>Mr. Miller's</i>	204
<i>M. De Chateau Vieux's</i>	188
<i>Drill machine described,</i>	292
directions for using,	309
<i>Dung,</i>	33
misapplied injurious to corn,	31
should not be mixed with quick lime,	31

B b

E

E.

<i>Exhalation, effects of</i>	70
<i>Experiments on apple trees</i>	323
carrots,	285
cherry trees,	324
clay,	332
fattening hogs,	217
Geraniums,	324
manures for pastures,	327
manures for arable,	333
peas,	119---124
potatoes,	132---140
turnips,	236---240
wall fruit trees, - - - - -	325

F.

<i>Fallows unnecessary</i>	121
<i>Fallow crops</i> ,	121
<i>Farmers, their general ambition</i> ,	10
should be masters of their farms,	17
absurd prejudices against improvements, - - -	169
<i>Farm yards</i> ,	35
<i>Fly on turnips, best preventative</i> ,	244
<i>Frost, effects of</i>	73

G.

<i>Gossy lands</i> ,	26
<i>Grain, great increase of</i>	248
drilled at about seven inches most productive.	289
largest and plumpest best for seed,	259
particularly investigated with a microscope, ...	246

Grain,

INDEX.

387

<i>Grain</i> , number in a bushel,	304
why supposed to be injured by threshing,.....	264
<i>Gravelly soils</i> ,	18
<i>Green crops</i> , plowed in for manure,.....	19
<i>Growth</i> of beans, peas and potatoes, investigated, 152 to 156	

H.

<i>Hail</i> , effects of	74
<i>Hair</i> ,	54
<i>Harrowing pastures</i> , advantages of	63
<i>Heat</i> , effects of, on vegetation,.....	70
<i>Heaths</i> , and golly lands,.....	26
<i>Hoes</i> , description of	302
<i>Hoeing</i> , utility of	208
<i>Hogs</i> , experiments on fattening.....	217
full grown most advantageous to fatten,	233
<i>Horse beans</i> , number in a bushel,	304
<i>Horses</i> on a farm should be always employed,.....	8

I.

<i>Imperfections</i> of the old mode of husbandry pointed out,	267
<i>Inches</i> in drills on an acre of land,	305

K.

<i>Kelp</i> , made from sea weeds,.....	65
---	----

L.

<i>Lands</i> , wet, how best improved,	94
rendered fertile by prudent culture,	11
<i>Land</i> , to cultivate without summer fallow,	369

B b 2

Leather

<i>Leather</i> , cuttings of	54
<i>Lime</i> , quick	23
deprives alkalies of fixed air,	63
when injurious,	306
<i>Lightening</i> , effects of,	76
<i>Loamy soil</i> ,	18
<i>Loss</i> sustained by improper management,	119

M.

<i>Machine</i> , the hint for making, taken from a mill -----	289
Drill, description and use of, -----	292
<i>Madder</i> given to hogs,	227
<i>Malt dust</i> ,	59
<i>Manure</i> , alkaline	60
<i>Manures</i> , when injurious, -----	258
<i>Marle</i> , -----	46
<i>Mechanics</i> explained,	15
<i>Meazles</i> in hogs, how to prevent and cure,	228
described,	217
<i>Moors</i> and Boggy soils,	19
<i>Moss</i> , to kill,	44
<i>Mud</i> of pools, &c.	54

N.

<i>Natural Philosophy</i> explained,	68
<i>New mode</i> of cultivation pointed out,	271

O.

<i>Oats</i> investigated with a microscope,	247
weight, and number of in a bushel, -----	250
<i>Obstructions</i>	

INDEX.

389

<i>Obstructions in hogs, to remove</i>	227
<i>Oil most effectual steep for turnip seed, to prevent</i> <i>being destroyed by the fly,</i>	246
<i>its effects on grain and pulse,</i>	245
<i>Ordure, human</i>	33

P.

<i>Pastures, how benefitted by harrowing,</i>	63
<i>best season for breaking up,</i>	121
<i>Peas, experiments on</i>	119--124
<i>the second best fallow crop,</i>	156
<i>Peas and beans, to raise an early crop of,</i>	327
<i>number in a bushel,</i>	304
<i>Philosophy natural, explained,</i>	68
<i>Porkers, experiments on</i>	229
<i>Potatoes the best fallow crop,</i>	155
<i>experiments on</i>	132--140
<i>value of, for fattening hogs,</i>	232
<i>Proposals, the author's to the public,</i>	317
<i>Plowing and harrowing,</i>	108
<i>frequent, advantages of to loamy soils,</i>	108
<i>old pastures improved by,</i>	104
<i>M. Duhamel's observations on,</i>	109
<i>Sir Hugh Platt's ditto,</i>	113
<i>Mr. Delu's ditto,</i>	113
<i>Powder black, observed on grain,</i>	264

R.

<i>Rain, effects of</i>	80
<i>Recipe for gentlemen who farm their own estates to</i> <i>get rich,</i>	375
	<i>Red</i>

<i>Red soils,</i>	24
<i>Retrospective view of crops,</i>	145
<i>Rooks, very injurious to the tillage farmer,</i>	274
serviceable to pastures,	275
<i>Rolling, when beneficial,</i>	214
when injurious,	215
<i>Roots of barley investigated by Dr. Hunter,</i>	187
<i>Rot in sheep, cause and cure,</i>	348
<i>Rubbish, of brick and lime,</i>	49

S.

<i>Salt common, not beneficial to vegetation,</i>	45
applied for fattening hogs,	226
<i>Salt Petre given to hogs,</i>	227
<i>Sandy soils,</i>	18
<i>Saw dust,</i>	50
<i>Sea sand,</i>	46
weeds,	47
<i>Seed, a less quantity required on rich than poor soils,</i>	264
<i>Sheep cause of, and cure for the rot,</i>	349
<i>Shells of sea fish,</i>	48
<i>Smut in wheat, cause of and cure,</i>	369
<i>Snow, effects of,</i>	75
<i>Soap suds, an excellent manure,</i>	59
<i>Soaper's ashes, an excellent manure for clay soils,</i>	39
<i>Soils, poor, requires more seed than rich,</i>	261
<i>Soot, a good top dressing,</i>	44
<i>Steep, the alkaline, how to prepare,</i>	263
recommended for barley and peas,	307
<i>Sulphur, flowers of, used for fattening hogs,</i>	227
<i>Sun, effects of</i>	70
	T.

INDEX.

391

T.

<i>Tanner's bark</i> ,.....	50
<i>Thistles and weeds</i> , to kill	42
<i>Trees</i> injurious to land,	99---102
<i>Turnips</i> , experiments on.....	236---240
directions for drilling	307
<i>Dr. Hunter's</i> observations on	176
examined through a microscope,	245
oil the best steep to prevent their being de-	
stroyed by the fly,	243

U.

<i>Urine</i> , stale a most excellent manure,	55
---	----

W.

<i>Weeds</i> should be burnt,	47
<i>Wheat</i> , experiments on	130—134—137—280
<i>M. L. De Chateau-Vieux's</i> experiments on, ..	188
weight, and number of grains in a bushel, .	304
spring, directions for cutting,	285
<i>Wheat</i> , smut, the cause of and cure,	369
<i>Woollen rags</i> , -	54
<i>Worms</i> , red, experiments on -	265

